

# Computational Mathematics for the Life and Management Sciences

**Math 132 Summer I 2014, Section 2** one credit hour

**Instructor:** Daniel Brake

**Office Hours:** TBD in first class by popular vote

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## Harrelson Hall G100

This one credit course will introduce life and management science students to current computing tools, which are important to their major areas of study. Many applications will be given involving fitting of data, differential equations, and optimization in two or more variables. The prerequisites are at least a C grade in the first semester of calculus such as MA 121 or 131.

### Goals

- learn basic ways of working with data and mathematical models
- become competent at using spreadsheets and computer algebra systems (Excel and Maple) solidify your understanding of the concepts in Calculus
- learn to apply your knowledge to real-world problems.

The computing tools will be the Excel spreadsheet and Maple computer algebra system. These tools will be used to illustrate the basic concepts in the first course in calculus for the life and management science students.

### Text

Course material is online, at its own web page,

<http://www.math.ncsu.edu/MA132>

All our lessons can be found there, in html or pdf files. You are expected to read the full lesson before each class. We will review it in class, and then plunge into our lab work on the computer. You may want to print the lesson. Many people find it easier to take notes on a hard copy of the lesson - and good note-taking will help with your homework.

### Prerequisites

C or better in MA 121 or 131. The odds are pretty good that nobody remembers everything learned in Calculus, so keep a copy of a Calculus book handy for review of the concepts.

### Software

We will be using Excel, WebAssign, and Maple. You are welcome to use your home computer, but be sure you have all these resources, including the "linest" and "solver" features of Excel. I will sometimes send emails to the whole class with announcements, reminders, hints, and clarifications. You are expected to read your email at least a couple of times a week.

### Expenses

There is an expense of ~\$22.95 for WebAssign.

### Attendance

Come to class, in accordance with REG 02.20.03

### Courtesy

Be a reasonable human being.

## Help

First, check the [Frequently Asked Questions](#). Come to office hours, or send e-mail. Ask each other. [The Multimedia Center](#) staff can help with computer-related questions. The Math department is offering quick introductions to [Maple](#) and [WebAssign](#) the first week of classes.

## Academic Honesty

Accord with NCSU POL 11.35.1, and the Pack Pledge. Do your homework yourself.

## Privacy

Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics, and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

## Grading Policy

Your grade will be computed on the basis of 100 points.

There will be 14 graded assignments, each worth 8.25 points. The first day's practice assignment counts as 1 point. Nothing else counts in computing your grade.

Your course grade will be computed as sum of the highest 12 assignment grades, plus the single point for the first intro assignment. Because of this generous grading policy, **there are no makeup or extra credit assignments**. Late assignments will **not** be accepted.

Adding the course late and missing the first assignment still counts.

There may be exceptions if the university is closed (e.g. for hurricanes). There is no final exam.

Statement for students with disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG 02.20.01)

## Letter grades

A+ $\geq$ 98	B+ $\geq$ 88	C+ $\geq$ 78	D+ $\geq$ 68
A $\geq$ 93	B $\geq$ 83	C $\geq$ 73	D $\geq$ 63
A- $\geq$ 90	B- $\geq$ 80	C- $\geq$ 70	D- $\geq$ 60

# Tentative Schedule

For weekly assignments, go to WebAssign.

<http://www.math.ncsu.edu/MA132/schedule.html>

date	lesson	major concepts	major or new tools
May 20	Getting Started	<ul style="list-style-type: none"> <li>· course mechanics</li> </ul>	<ul style="list-style-type: none"> <li>· 132 webpage</li> <li>· WebAssign</li> <li>· Excel</li> <li>· Maple</li> </ul>
May 20	Declining Prices, Profits and Graphing Introduction to Maple	<ul style="list-style-type: none"> <li>· graph of a function</li> <li>· max/min</li> <li>· suits example</li> </ul>	<ul style="list-style-type: none"> <li>· Excel: series</li> <li>· Maple: diff, solve, plot</li> </ul>
May 20	Price Data and Trendlines	<ul style="list-style-type: none"> <li>· data fitting</li> <li>· least squares</li> </ul>	<ul style="list-style-type: none"> <li>· Excel: trendline</li> <li>· Maple: subs</li> </ul>
May 22	Price Data for Two Markets and Linear Estimation	<ul style="list-style-type: none"> <li>· functions of 2 variables</li> <li>· data fitting in 2 variables</li> </ul>	<ul style="list-style-type: none"> <li>· Excel: linest</li> <li>· Maple: subs</li> </ul>
May 22	Property Appraisal and Linear Estimation	<ul style="list-style-type: none"> <li>· functions of several variables</li> <li>· best fits without graphing</li> </ul>	<ul style="list-style-type: none"> <li>· Excel: linest</li> <li>· Maple: subs</li> </ul>
May 27	Savings Plans and First-Order Finite Differences Maple Worksheet	<ul style="list-style-type: none"> <li>· finite difference equations</li> <li>· financial modeling</li> <li>· exact solution to difference equations</li> </ul>	<ul style="list-style-type: none"> <li>· Excel: series</li> <li>· Maple: subs</li> </ul>
May 27	Loans and First Order Finite Differences Maple worksheet	<ul style="list-style-type: none"> <li>· finite difference equations</li> <li>· exact solution of a linear difference equation</li> </ul>	<ul style="list-style-type: none"> <li>· Excel: series</li> <li>· Maple: solve, subs</li> </ul>
May 29	Cooling Model and Euler Finite Difference Method Maple worksheet	<ul style="list-style-type: none"> <li>· physical modeling</li> <li>· differential equation as limit of difference equation</li> <li>· closed-form solution</li> <li>· equilibrium</li> </ul>	<ul style="list-style-type: none"> <li>· Excel: series</li> <li>· Maple: solve, dsolve</li> </ul>
June 3	Population Models and Exponential Functions	<ul style="list-style-type: none"> <li>· population modeling</li> <li>· differential equations</li> <li>· closed-form solutions</li> <li>· exponential growth and decay</li> <li>· logarithmic axes</li> </ul>	<ul style="list-style-type: none"> <li>· Excel: trendline</li> <li>· Maple: dsolve</li> </ul>
June 5	Population Models and Numerical Methods Maple worksheet	<ul style="list-style-type: none"> <li>· population models</li> <li>· logistic growth</li> <li>· closed-form solution</li> <li>· equilibrium</li> </ul>	<ul style="list-style-type: none"> <li>· Maple: dsolve, DEplot</li> </ul>
June 10	Profit from 2 markets and partial derivatives Maple Worksheet	<ul style="list-style-type: none"> <li>· multivariate optimization</li> </ul>	<ul style="list-style-type: none"> <li>· Excel: solver</li> <li>· Maple: diff, solve</li> <li>· Maple: plot3d, contourplot</li> </ul>
June 12	Alcohol Breath Testing and Least Squares Data Fitting	<ul style="list-style-type: none"> <li>· least squares</li> <li>· critique of mathematical models</li> </ul>	<ul style="list-style-type: none"> <li>· Excel: solver</li> <li>· Maple: subs, plot</li> </ul>
June 17	Population Growth: Raleigh and Wake County	<ul style="list-style-type: none"> <li>· population models</li> <li>· closed form solutions of differential equations</li> <li>· least squares</li> </ul>	<ul style="list-style-type: none"> <li>· Excel: solver</li> <li>· Maple: dsolve</li> </ul>
June 19	Population Growth: the World	<ul style="list-style-type: none"> <li>· population models</li> <li>· closed form solutions of differential equations</li> <li>· least squares</li> <li>· critique of mathematical models</li> </ul>	<ul style="list-style-type: none"> <li>· Excel: solver</li> <li>· Maple: dsolve</li> </ul>