Course Objective:

- **Computer Algebra Systems (CAS)** such as MAPLE, MATHEMATICA, MATHCAD, AXIOM, MuPAD, REDUCE, ... have become indispensable tools of modern mathematical, scientific and engineering computing. This is especially true if we have to solve complex mathematical problems in the physical or engineering sciences. With this in mind, the first objective of this course will be to familiarize students with one such system, the MAPLE Computer Algebra System and how it is used in mathematical, scientific and engineering computations. The second objective is to introduce students to mathematical computer programming using the MAPLE programming language. To this end students will learn how to implement problem-specific algorithms in the MAPLE programming language.

- Maple basics, 2-D and 3-D plotting, doing Calculus, Differential Equations and Linear Algebra with Maple, Programming with Maple


Contents: Selected topics from Chapters 1-7 of Mathematical Computing.

Software:

Maple will be used in class and for some assignments. The computers in the Mathematics labs in Temple 3305 have Maple 13. However, for those of you who want to have Maple at home, you can get the student version of Maple at a special discount. To get the Student version of Maple at a half price you can go to [http://webstore.maplesoft.com](http://webstore.maplesoft.com) and use the promotional code **VCU0708**.

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<thead>
<tr>
<th>Exams</th>
<th>Points</th>
<th>Exam Dates</th>
<th>Grading Scale</th>
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<tbody>
<tr>
<td>Exam 1</td>
<td>(150 pts)</td>
<td>Thur. Feb 11</td>
<td>A [850, 1000]</td>
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<tr>
<td>Exam 2</td>
<td>(150 pts)</td>
<td>Thur. March 11</td>
<td>B [750, 900]</td>
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<tr>
<td>Exam 3</td>
<td>(150 pts)</td>
<td>Thur. April 15</td>
<td>C [600, 750]</td>
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<td>Final Exam</td>
<td>(250 pts)</td>
<td>Tuesday May 11</td>
<td>D [500, 600]</td>
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<td>Home/Class work</td>
<td>(300 pts)</td>
<td>(1:00-3:50 PM)</td>
<td>F [0, 500]</td>
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<td>Total possible</td>
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# Topic List

## Part I: Intro. to what Maple can do

### MAPLE BASICS
- MAPLE Interfaces, the MAPLE Worksheet Interface
- MAPLE Syntax and Special Symbols
- Assignment, Evaluation, Substitution, and Simplification
- Sequences, Lists, Sets, Characters and Strings

### PLOTTING AND ANIMATION
- 2-D plotting, the Plots Package and Animation
- The plot3d Function
- Interacting with Three-Dimensional Plots

### NUMERICAL & SEMI-NUMERICAL COMPUTATION
- Number Systems
- Floating-Point Computation in MAPLE
- Multiple Roots, Aliases and Algebraic Numbers
- Computing with Modular Integers

### ELEMENTARY MATH & MAPLE
- Algebra and Trigonometry with MAPLE
- Calculus with MAPLE
- Discrete math with MAPLE
- Matrix Algebra with MAPLE

## Part II: Programming with MAPLE

### LOGIC AND CONTROL STRUCTURES
- Relational Operators and Boolean Algebra
- Boolean Operators in MAPLE: and, or, not
- The for, do and while Loops
- Conditional Execution: if
- Piecewise-Defined Functions

### PROCEDURES AND RECURSION
- Procedure Definition Syntax
- Variable Scope, Procedure Arguments
- Terminating Procedure Execution
- Recursion and Procedures that Output Plots

### OPERATORS AND FUNCTIONS
- Operators
- Composition of Mappings and Functions
- Set Operations

### DATA TYPES
- Primitive Types and Alternative Types
- Structured or Nested Data Types
- Special Procedure-Argument Types

### CONVENTIONAL PROGRAMMING
- Operations on Structures
- Data Processing in MAPLE
- Interactive Programs in MAPLE

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## My Suggestions

1. Come to class and make sure to attempt as many problems as you can from each section.
2. Always seek understanding, not memorization.
3. Read your book; if need be use some books as references from the library.
4. Stop by my office as often as you wish and need to; don't hesitate if I look busy. I will always be busy, but I want you to know that you are my first and absolute priority and I will do everything I can not to put anything ahead of you.
5. Last but not least, have a positive attitude towards the course. Don't fall behind. Set high standards for yourself and I will do my best to help you reach those standards.
Accommodations for the Disabled

Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 require VCU to provide an academic adjustment and/or a reasonable accommodation to any individual who advises us of a physical or mental disability. If you have a physical or mental limitation that requires an academic adjustment or an accommodation, please arrange a meeting with me at your earliest convenience. Additionally, if your coursework requires you should advise me of any concerns you may have regarding safety issues related to your limitation(s).

Note: Please contact the appropriate Coordinator of The Office of Disability Support Services (http://www.students.vcu.edu/dss/) to obtain an official memo detailing the academic adjustments or accommodations which you need.

Honor Code

Virginia Commonwealth University recognizes that honesty, truth, and integrity are values central to its mission as an institution of higher education. The Honor System is built on the idea that a person’s honor is his/her most cherished attribute. A foundation of honor is essential to a community devoted to learning. Within this community, respect and harmony must coexist. The Honor System is the policy of VCU that defines the highest standards of conduct in academic affairs. The Honor System in its entirety can be reviewed on the Web at: http://www.provost.vcu.edu/pdfs/Honor_system_policy.pdf or it can be found in the 2008-09 VCU Insider.

Unless stated otherwise every work in this course is pledged. Should I become convinced that a violation (such as cheating) has occurred, I will not give a warning or ask for an explanation. Instead, I will file a formal charge to the appropriate University Office. You are encouraged to study together and discuss home-works, but the write up and answers should be your own.

VCU Statement on Safety

- What to know and do to be prepared for emergencies at VCU:
  - Sign up to receive VCU text messaging alerts (www.vcu.edu/alert/notify).
  - Keep your information up-to-date.
  - Know the safe evacuation route from each of your classrooms. Emergency evacuation routes are posted in on-campus classrooms.
  - Listen for and follow instructions from VCU or other designated authorities.
  - Know where to go for additional emergency information (www.vcu.edu/alert).
  - Know the emergency phone number for the VCU Police (828-1234). Report suspicious activities and objects.

Student Conduct

VCU has policies and procedures designed to create an environment conducive to academic excellence. One of these policies can be found in the web at http://www.pubapps.vcu.edu/bulletins/about/?uid=10096&iid=30774. In addition, during class it is expected that communication devices such as cell phones, pagers, etc. are in silent mode.