

Calculus & *Mathematica* Classes

Important Note

The description and assessment materials presented below pertain to Calculus & *Mathematica* classes. They have been designed by some of our best instructors in this format and therefore characterize the “best practices” for the format and give assessment criteria appropriate for an instructor teaching this format. Experienced instructors who have taught in multiple formats often adopt a mixture of styles, and so the criteria here may not apply at all times. In such cases, the *overall effectiveness of instruction* represents the bottom line when assessing good teaching.

Overview. Calculus & *Mathematica* (C&M) has a number of important guiding philosophies; one of these is that the program should be flexible enough to incorporate different instructors’ styles. Consequently, the description here provides guidelines rather than rigid rules of practice in a C&M class.

C&M courses have two different instructional components: “lab time” and “classroom time” (though occasionally an instructor may choose to hold classroom time during a lab). Two to four days each week are lab sessions; one or two days each week are classroom time. During a lab, students work on homework assignments, generally in groups of two or three (though well motivated students may complete their work independent of the labs). During classroom time, the instructor interacts with the class as a whole, asking and answering questions or explaining finer points from the lessons.

C&M Class Materials. C&M lessons are written in four parts:

- *Basics*, a discussion of the theory for the lesson
- *Tutorials*, a collection of several worked-out examples
- *Give It a Try*, problems without answers (from which assignments are drawn)
- *Literacy Sheets*, containing problems that students should be able to work without computer assistance

Lab Time. A new lesson begins with a homework assignment. Students download a list of the problems that are assigned, and set to work on them at the computer. Their homework is done on the computer and submitted electronically. Students are strongly encouraged to work in groups, though independent work is not discouraged. During this time, the instructor should move about the room paying attention to the interactions among the students. This serves a dual purpose. First, it makes the instructor available and approachable for student questions. The instructor should answer these, where possible, by referring the student to the appropriate material in the *Basics* and *Tutorials* material, or by encouraging interaction with group-mates or with other groups. Second, by circulating about the room, the instructor has the opportunity to inject examples or questions into conversations where students have already grasped the basic ideas and need to be pressed for deeper insight.

The Class Assistant. The C&M instructor has an ally in trying to keep the lab sessions running smoothly: the class assistant. This is an undergraduate who has previously completed the course and therefore has a good understanding of what it involves. The class assistant should be able to answer basic questions on mathematical content and to direct students to the appropriate sections of the class materials for help. He or she

should also be able to handle questions about *Mathematica* syntax and the other software used in the lab. The class assistant helps with the grading of assignments, often holds review sessions, etc. A good working relationship between the instructor and the class assistant is a key ingredient in a successfully taught C&M class.

Homework Assignments. Students complete homework problems using either of two common approaches. Some students begin by carefully reading through the basics and tutorials, then deal with the individual problems assigned. Others start with the problems and refer back to the basics and tutorials in an attempt to find applicable material. Since homework is the core of C&M, it is important that instructors choose assignments carefully. They need to choose problems that cover all of the key points, but not so many problems that the students gloss over the material instead of thinking about each problem.

Classroom Time. Classroom time is held after the students have had a chance to work with the material and when students have had an opportunity to decide what they want to have the instructor discuss in greater depth. During this time the instructor generally interacts with the class as a whole, asking and answering questions or explaining finer points of the lesson. This usually takes the form of an “interactive mini-lecture,” guided in large part by student questions or student responses to instructor questions. It is vital that the material covered in classroom time be closely tied to the material that students deal with on the computer. One of the easiest mistakes to make in the C&M format is to leave students feeling that the material presented in classroom time is divorced from the lessons on the computer.

Literacy Sheets. The literacy sheets are used to provide examples that the class and instructor can work to illustrate a point. They are the most common way of ensuring that the students see the connection between classroom time and the computerized lessons. They are also meant to test basic skills in hand computations that involve the elements in the course.

Math 242 Section E8
Spring Semester 2001
1:00-1:50 P.M. MWF
24 Illini Hall and 243 Altgeld Hall

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Office Hours: Wednesdays 3-5pm and by appointment (ask or email me).

Class Assistant: Ross Mohr

Email: rossmohr@uiuc.edu

Homework: Homework and their due dates will be posted in the coursespace. Due to the interactive nature of this course, it is vital that you don't fall behind in assignments. There will be penalties for late homework. Homework that is more than a week late will not be graded. If some problem occurs that prevents you from getting HW in on time (severe illness, death in the family, computer crashing and burning), send me a note on email, explaining what the situation is. In certain circumstances I may extend the deadline.

You are strongly encouraged to work in groups (at most 3 people). For the first three homeworks this is compulsory! Each person in the group will receive the same grade for the homework. You may work with anybody you like, provided that you don't work with the same person for more than three homeworks. There are points for clarity and style as well as correctness of solutions, so put in Text cells explanations of what you are doing. To make the job of grading easier, could you please follow the following guidelines for homework:

- 1 The names of each member of the group **MUST** be on the HW.
- 2 The answers should have green for the background color (instructions for how to do this to come....)
- 3 The problems should be in the order assigned.

Exams: There will be two in-class exams, a final exam and weekly quizzes. The quizzes and exams will mostly be taken from the literacy sheets. Attendance at the exams is compulsory, failure to attend will result in a zero grade.

Grades: The grades will be decided in the following way:

Homework 50%, Final exam 25%, In-class exams 10% each, Quizzes 5%.

Letter grades follow the scale below. 98-100 A+, 93-97 A, 90-92 A-, 88-89 B+, 83-87 B, 80-82 B-, 78-79 C+, 73-77 C, 70-72 C-, 68-69 D+, 63-67 D, 60-62 D-, Less than 60 is F.

Other Stuff: There is heaps of extra information on the *Calculus and Mathematica* webpage (such as Frequently Asked Questions, how to submit homework, a link to the coursespace etc, etc). This is found at: <http://www-cm.math.uiuc.edu/>
There is a shortcut webaddress which will get you directly to the coursespace, type: cm.math.uiuc.edu

The DROP DATE for the course is Friday, March 9.

The FINAL EXAM will be on Saturday, May 5 from 1:30-4:30PM.

Syllabus for Calculus & *Mathematica* 242 Sections at Illinois

Jan 2001

Math 242 (3 credit hours):

C&M Text: Vector Calculus and *Mathematica* CD-ROM

VC00 Reference Lessons

VC01 Vectors

VC02 Perpendicularity

VC03 Gradient

VC04 Trajectories

VC05 2D Measurements

VC06 Sources

VC07 Transform 2D Integrals

VC08 Transform 3D Integrals

VC09 Spherical Coordinates

VC10 3D Measurements

VC11 3D Flow Along (optional)