

**Philadelphia University**  
**Department of Basic Sciences and Mathematics**

Summer Semester

Course Syllabus

2011/2012

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**Course Title** Computer Aided Mathematics  
**Course Code** 250372  
**Lecturer**  
**Office Room**  
**Office Hours**  
**E-mail**  
**Webpage**

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### Course Description

In this course, the student learns the most important mathematical software; Mathematica, which is applied in different mathematical areas such as Calculus, Numerical Analysis, Statistics and Differential Equations.

### Topics by the Week

Week	Topics
1	<b>Introduction.</b> Mathematica as a calculator. Numbers. Algebraic computations. Trigonometric computations. Variables. Equalities =, :=, ==. Dynamic variables. <b>Defining functions.</b> Formulas as functions. Anonymous functions.
2	<b>Lists.</b> Functions producing lists. Listable functions. Selecting from a list. <b>Changing heads!.</b>
3	<b>A bit of logic and set theory.</b> Being logical. Handling sets. Decision making, If and Which. <b>Sums and products.</b> Sum. Product.
4	<b>Loops and repetitions.</b> Do, For a While. Nested loops. Nest, NestList and more. Fold and FoldList. Inner and Outer.
5	<b>Substitution, Mathematica rules.</b> <b>Pattern matching.</b> <b>Functions with multiple definitions.</b> Functions with local variables. Functions with conditions.
6	<b>Recursive functions.</b> <b>Linear algebra.</b> Vectors. Matrices. <b>Graphics.</b> Two-dimensional graphs. Three-dimensional graphs.
7	<b>Calculus and equations.</b> Solving equations. Calculus.
8	<i>Final Exam.</i>

### Course Objectives

The purpose of the course is, quite simply, to systematically teach students the basic use of Mathematica. The ideal student will have a desire to learn how to use Mathematica and will have continuing access to do so. Of course, Mathematica is a huge program; we could literally design full graduate level courses around a single command. Thus, we must focus the course by choosing an appropriate objective. My objective is to give students the

requisite skills to confidently approach a variety of mathematical problems using the tools provided by Mathematica. Furthermore, I'd like to make sure that students understand the fundamentals, the basic structure, and the help system well enough to progress further on their own. These have been my main considerations in setting up the course outline. Needless to say, this could change and it is quite possible that some topics will take more than one session. The outline hopefully illustrates the content of the course closely enough, however.

### Learning Outcomes

- Understand the programming environment of Mathematica.
- Solve different mathematical problems (symbolically and numerically) using Mathematica.
- Write Mathematica programs.

### Assessment Distribution

Students will be assessed based on a 100 total marks, which are distributed as follows.

Exam Type	Expected Time	Points Allocated
First		20%
Second		20%
Homeworks		20%
Final		40%

### Textbook and Supporting Materials

- Roozbeh Hazrat, **Mathematica: A Problem Centered Approach, 1st Edition**, Springer 2010. Call number in PU library: Not available.
- Cheung, Keough, Gross, and Landraitis, **Getting Started with Mathematica, 3rd Edition**, John Wiley & Sons, Inc. 2009. Call number in PU library: 510.285536 GET.
- Eugene Don, **Schaum's Outline of Mathematica, 2nd Edition**, McGraw-Hill 2008. Call number in PU library: Not available.

### Class Attendance

Attendance is expected of every student. Being absent is not an excuse for not knowing about any important information that may have been given in class. Under the University's regulations, a student whose absence record exceeds 15% of total class hours will automatically fail the course. Students who in any way disrupt the class will be expelled from the classroom and will not be allowed to return until the problem has been resolved.

**Late Exams**

Late (make-up) exams will be given only to students who have a valid excuse and are able to provide a written document for its verification. The level of difficulty of a late exam is about 50% higher than that of the corresponding regular exam. All late exams will be conducted during the last week of the semester. Each student is allowed only one make-up in a semester, either for the first exam or the second, but not both. There is no make-up for a late exam.

**Dishonesty**

Any form of dishonest conduct will be strictly punished. A student who is caught cheating, or attempting to do so in an exam will be given a zero for the exam and a report will be written to the Dean for further action. A student who helps another student or is seen communicating with another student in an exam will be given the same penalty stated in the previous point. Students with different exam forms are not exempt from the above rules. Repeat offenders will be expelled permanently and banned from future courses.