

UCSCIMAT11 Calculus and Linear Algebra

Course Information

Instructor and Course Meeting Information

Instructor: Dr. Lola Thompson

Pronouns: She/Her/Hers

E-mail: l.thompson@uu.nl

Class Meetings: In N-G

M 9:00 - 10:45

W 11:00 - 12:45

Office Hours: In N-Ee

M 11:00 - 12:00

W 10:00 - 11:00

Learning Objectives

By the end of this course, you will be able to:

- explain your thought processes in a clear, logical manner;
- apply your theoretical knowledge to solve a variety of real-world problems;
- integrate a wide variety of functions;
- map the progression of ideas that lead us to approximate functions with Taylor series;
- find solutions to simple ordinary differential equations;
- apply basic techniques of linear algebra, including matrix diagonalization;
- optimize functions of several variables, with and without constraint.

Textbook

In lieu of a textbook, we will be using course notes written by Viktor Blåsjö, which are available on our course Blackboard page.

Prerequisites

Secondary school knowledge of mathematics is required. This could be acquired in IB Higher Level Math, Dutch VWO Wiskunde B or Wiskunde D, or similar Calculus and Algebra courses from a foreign high school. If in doubt, ask the lecturer as early as possible. A self-test is available on Blackboard to help you assess your level of preparation. Students who do not meet these requirements should take UCACCMAT01 first.

Grades

The grades in this course will be calculated as follows:

| | number | percentage each | total percentage |
|---------------------|--------------|-----------------|------------------|
| Class Participation | – | – | 10% |
| WeBWorK | ≈ 14 | $\approx 1.5\%$ | 20% |
| Written Assignments | 4 | 5% | 20% |
| Midterm Exam | 1 | 20% | 20% |
| Final Exam | 1 | 30% | 30% |

Exams and written assignments will be graded on a scale of 100 points and then converted to letter grades according to the following table.

| | | | | | | | | | |
|----|--------|----|-------|----|-------|----|-------|---|------|
| A+ | 96–100 | B+ | 77–81 | C+ | 64–67 | D+ | 51–54 | | |
| A | 88–95 | B | 72–76 | C | 59–63 | D | 46–50 | F | 0–35 |
| A– | 82–87 | B– | 68–71 | C– | 55–58 | D– | 36–45 | | |

Course Structure

A typical class period will consist of a mixture of short lectures and group problem solving. In particular, all lectures will take place during our scheduled class periods. That said, all of my lectures will be recorded and you can always re-watch them on Blackboard.

Class Participation

Attendance: Each student is granted three “unexcused” absences. After that, each additional absence will result in a 1 point deduction from your Class Participation grade. There is no need to e-mail me to explain an unexcused absence. If you have a prolonged illness or another conflict that will cause you to miss more than three classes, please contact me so that we can discuss appropriate accommodations.

Group work: Working groups will be assigned. They will normally consist of 3-4 students. Groups will be shuffled (approximately) every two weeks. That way, you will have the opportunity to work with most of your classmates by the end of the semester. If you are having a serious problem with someone in your assigned group, please contact me ASAP.

Students who do not have excessive absences (as defined above) and who participate regularly in the group work discussions will receive full credit for the Class Participation grade.

Homework Assignments

There will be one WeBWorK assignment for each section of the textbook that we cover in class. Assignments will be due at the beginning of the first class period following the completion of a given textbook section. Generally, this will translate to 1 WeBWorK assignment per week. All deadlines will be posted on our course’s WeBWorK site, which can be found at <https://webwork.science.uu.nl/webwork2/UCSCIMAT11>. You can find detailed information on how to use WeBWorK on our course Blackboard page. You are responsible for keeping track of the deadlines – once an assignment closes, it cannot be re-opened.

There will also be four written assignments. Unlike WeBWorK, these will require you to write careful explanations of your ideas. You must explain your reasoning in full sentences and show all of your work. You can find the deadlines for the written assignments at the end of this document. For written assignments, if you do not earn all points, you can hand in a written supplement a week later. You can then earn back some, but not all, of the points that you missed. If you choose to re-submit your work, you must hand in your original solution, with the comments and grade on it, along with a separate supplement where you address or rewrite the parts for which you lost points.

Exams

There will be two in-class exams: a midterm exam before the spring break, and a final exam at the end of the semester.

Blackboard

Copies of all course materials will be posted on our course Blackboard site. Go to <http://uu.blackboard.com> to access these materials.

Course Policies

Academic Honesty

WeBWorK

You are welcome to consult the course text, your class notes, and the instructor. I also encourage you to form (virtual) study groups with other students, provided that you abide by the following guideline: you may discuss the general problem-solving techniques for WeBWorK problems with other students, but you must independently arrive at the answers that you submit.

Written Assignments

You are encouraged to discuss the written assignments with one another, but the work you hand in must reflect your own understanding. In case of direct copying, both students' work will be downgraded.

Exams

You are not allowed to consult any source *other than the instructional staff* during the exams. In particular, this means that you may not use any of the following to assist you with solving the exam questions: *calculators, smartphones, laptops, notes, textbooks, Chegg.com, classmates, etc.* You MAY contact the instructor or TA to ask clarifying questions (e.g. "Should we assume that p is a prime?").

Note: Information about academic regulations can be found at the following website:

https://students.uu.nl/sites/default/files/arr_2020-2021_-_approved_version_for_publication.pdf. Please familiarize yourself with its content. All students are responsible for maintaining the highest standards of honesty and integrity in every phase of their academic careers. The penalties for academic dishonesty are severe and ignorance is not an acceptable defense.

Disabilities

Students in this course with disabilities, including "invisible" disabilities such as chronic diseases and learning disabilities, and who may need disability-related classroom accommodations, are encouraged to make an appointment to speak with me as soon as possible. *Please note that I cannot provide accommodations on exams until I receive documentation from the Disability Services Coordinator. You can find more information about Student Disability Services here:* <https://students.uu.nl/en/university-college-utrecht/student-life/special-support>

Make-up Policy

Typically, missed exams cannot be made up. That said, I understand that some situations are beyond your control. Should you contract a serious illness, please contact me immediately. I will be happy to make arrangements with you under these types of extreme circumstances.

Religious Observances

Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in the course, please contact me before the end of the second week of the semester to discuss appropriate accommodations.

Withdrawing From The Course

Students who receive a failing grade on the midterm examination are encouraged to speak with me immediately in order to determine the best course of action. Please do not withdraw from the course without speaking to me first. Chances are high that you can still pass the course with a proper plan in place.

Other Useful Information

Seeking Help

Because math topics have a tendency to build on one another, students may find it difficult to catch up after falling behind in their UCSCIMAT11 coursework. Fortunately, there are a number of academic resources available to the students who seek them out:

1) *My office hours*: I am available at regularly scheduled times to answer your questions on the course material (see “Instructor and Course Meeting Information” above). I am always happy to discuss current homework assignments during my office hours.

2) *Your classmates*: The other students in the course can be one of your most valuable resources. You are strongly encouraged to form study groups, provided that you abide by the policies outlined in the “Academic Honesty” section above.

3) *Tutoring*: Science student assistants are available for additional help outside of class. See the UCU intranet for their office hours, under Academics : Study Programme : Science.

Extra Practice

The best way to learn math is to *practice*. Some additional resources that you may wish to consult:

- **Old Exams** Before each of our scheduled exams, I will post an old exam from this course on Blackboard, which you are strongly encouraged to try for yourself.
- **Textbook Problems** You can find some extra problems from an old textbook for this course on our Blackboard page.
- **Re-Solve Old Problems** Some of the problems that appear on the exams will be very similar to the examples that I work out in class. Others will be similar to the problems that you solve on the WeBWorK and on the in-class worksheets. Practice re-solving them on your own, without looking at your notes.

Important Dates

| | |
|-----------------------------|---|
| Midterm Exam | March 9th (Wednesday) |
| Spring Break! | March 12th (Saturday) - March 20th (Sunday) |
| Mid-term Tutor Meetings | March 22nd (Monday) - 26th (Friday) |
| Good Friday (no classes) | April 15th (Friday) |
| Easter Monday (no classes) | April 18th (Monday) |
| King’s Day (no classes) | April 27th (Wednesday) |
| Liberation Day (no classes) | May 5th (Thursday) |
| Final Exam | May 13th (Wednesday) |

Course Schedule

The following is a rough schedule for the course. Please note that it may be adapted as needed.

| Date | Section | Brief Description | Homework |
|-------------|------------------|--|---------------------------------|
| 24/1 | 0.1-0.7 | Review of basic differentiation, integration | |
| 26/1 | 0.1-0.7 | Review of basic differentiation, integration | |
| 31/1 | 1.1-1.2 | Introduction to differential equations | WW 0 due |
| 2/2 | 1.1-1.2 | Introduction to differential equations | |
| 7/2 | 1.3-1.5; 2.1-2.2 | Separation of variables, partial fractions | WW I due |
| 9/2 | 1.3-1.5; 2.1-2.2 | Separation of variables, partial fractions | WA "Fishing" (1.2.2) due |
| 14/2 | 2.3-2.4 | Substitution, integration by parts | WW II due |
| 16/2 | 2.3-2.4 | Substitution, integration by parts | |
| 21/2 | 3.1 | Second-order differential equations | WW III due |
| 23/2 | 3.1 | Second-order differential equations | |
| 28/2 | 4.1-4.2 | Complex numbers and differential equations | WW IV due |
| 2/3 | 4.1-4.2 | Complex numbers and differential equations | WA "Warfare" (1.2.3, 1.3.2) due |
| 7/3 | 5.1-5.4 | Taylor expansions | WW V due |
| 9/3 | 5.1-5.4 | Midterm Exam ; Taylor expansions | |
| 13/3 - 21/3 | | No Class (Spring Break) | |
| 21/3 | 5.1-5.4 | Taylor expansions | |
| 23/3 | 6.1-6.2 | Vectors, Scalar Product | WW VII due |
| 28/3 | 6.1-6.2 | Vectors, Scalar Product | |
| 30/3 | 7.1-7.6, 9.1 | Matrices | WW VIII due |
| 4/4 | 7.1-7.6, 9.1 | Matrices | |
| 6/4 | 8.1-8.2 | Diagonalization | WW IX due |
| 11/4 | 8.1-8.2 | Diagonalization | WA "Fourier" (9.2.1, 9.2.2) due |
| 13/4 | 10.1-10.2 | Functions of several variables | WW X due |
| 18/4 | | No Class (Easter Monday) | |
| 20/4 | 10.1-10.2 | Functions of several variables | |
| 25/4 | 10.3 | Unconstrained optimization | WW XI due |
| 27/4 | 11.1 | Geometry of multivariate functions | WA "Google" (8.1.9) due |
| 2/5 | 11.2 | Constrained optimization | WW XII and WW XIII due |
| 4/5 | | Constrained optimization | |
| 11/5 | | Exam Review | WW XIV due |
| 13/5 | | Final Exam | |

Key: WA = Writing Assignment, WW = WeBWork