Special Topic: Algorithms and Mathematics for Games and Graphics - Course Outline
COMP 471: 2015 Trimester 1

This document sets out the workload and assessment requirements for COMP 471. It also provides contact information for staff involved in the course. If the contents of this document are altered during the course, you will be advised of the change by an announcement in lectures and/or on the course web site. A printed copy of this document is held in the School Office.

Objectives

This course will introduce applications of algorithms and mathematics to game and graphics programming. The concepts will be taught through computational and programming exercises with visual results.Topics may include mathematics for shading (vectors), geometric computations, linear systems with constraints, SVD, eigenvectors, and numerical considerations.

By the end of the course, students should be able to:
1. Use important concepts from linear algebra and calculus in understanding, implementing and creating computer graphics and game algorithms.
2. Understand the computational characteristics of several numerical algorithms in the context of graphics programming.
3. Construct computer graphics programs effectively using an existing library of mathematical and numerical functions and procedures.

The course requires that students have some previous experience in programming.

The course approach is based on the belief that Computer Graphics is best learned by doing. In the five assignments students will create simple graphics programs that use key mathematical concepts.

Students will also do several short (5-10 minute) oral presentations, explaining core mathematical concepts and their application to games and graphics.

Textbook and Resources

There is no set textbook for COMP 471.
* The book *Mathematics for 3D game programming and computer graphics* covers the course topics. It is available in both physical and electronic forms through the VUW library.
* The library also has two other relevant books: Sherrod, *Game Graphics Programming*, and Dunn, 3D Math Primer for Graphics and Game Development.
* The book *Maya Python for Games and Film* may be useful, and is on reserve at the VUW library.

Python and Numpy are installed on the ECS Linux computers. There are several free distributions that you can install on your home computer, see http://www.scipy.org/install.html

Lectures, Tutorials, Laboratories, and Practical work

A schedule of lecture topics, readings, and assignment due dates is available online

Lectures for COMP 471 are: *day time place*

COMP 471 is a trimester 1 course. The trimester starts on 2 March. Lectures end on 6 June. The examination period at the end of the course is 8 June - 1 July.

Assignments and Projects

Computer graphics is best learned by doing and showing the results. There will be five assignments that require mathematical graphics programming. In these assignments you will make use of an existing numerical library such as Python's *numpy*. All assignments address all three learning objectives.

For the presentations, the students should find an *intuitive* or visual explanation of the concept. In order to help understand how the particular concept is applied in graphics, the presentation should also include two examples that make use of the concept. Typically you may find these examples by searching research papers on blogs on the web. The source material can be from courses, blogs, papers, or books. The presentation should include excerpts from these sources, and may (*but need not*) include new text or illustrations. As a guideline, five slides may be sufficient. The

presentations will be held in the lecture time. The presentations address the first two learning objectives directly, and the third learning objective indirectly.

Work for marking should be submitted electronically using the ECS Submission System. The details of the assignments and projects will be provided in the lectures. The assignments and projects will due at 11:59pm on the indicated date.

Workload

In order to maintain satisfactory progress in COMP 471, you should plan to spend an average of at least 10 hours per week on this paper. A plausible and approximate breakdown for these hours would be:
- Lectures: 3 hours
- Readings and Presentations: 3 hours
- Assignments: 4 hours

School of Engineering and Computer Science

The School office is located on level three of the Cotton Building (Cotton 358).

Staff

The course organiser and lecturer for COMP 471 is:
- John Lewis
- Cotton 331
- +64 4 463 5233 x 7527
- John.Lewis@ecs.vuw.ac.nz

Announcements and Communication

The main means of communication outside of lectures will be the COMP 471 web area at http://ecs.victoria.ac.nz/Courses/COMP471_2015T1/. There you will find, among other things, this document, the lecture schedule and assignment handouts, and the COMP 471 Forum. The forum is a web-based bulletin board system. Questions and comments can be posted to the forum, and staff will read these posts and frequently respond to them.

Assessment

Your grade for COMP 471will be determined based on the following assessment weightings:

Item	Weight	
Five graphics programming assignments	50%	(10% each)
In-class presentations	15%	
Take-home Test (during examination period)	35%	

Tests and Exams

The timetable for final examinations will be available from the University web site and will be posted on a notice board outside the faculty office. The final examination will be three hours long. No computers, electronic calculators or similar device will be allowed in the final examination. Paper non-English to English dictionaries will be permitted. The examination period for trimester 1 is 12 June - 1 July.

Practical Work

The five assignments involve a small amount of programming as needed to show the graphics application of a particular math concept. These programs may be as small as 100 lines, and can be implemented if desired in a prototyping language such as Python/Numpy or Matlab.

All the materials for the assignments should be submitted electronically using the ECS Submission System. Other methods (e.g. email) are not accepted. Marked projects will be available at lectures, or from the School Office (Cotton 358). All projects must be submitted on time.

Students will hand in the presentation in Powerpoint or .pdf format on the day of the presentation.

The policy on late submission is as follows:

- The Presentations must be delivered on time to receive credit. The Assignments should be submitted on time, however, you can apply "Late days" as described below.

- Each assignment or project that is late (ie, submitted on the submission system after the deadline) will be penalised by 20 marks if it is up to 24 hours late, and penalised by 40 marks if it is between 24 hours and 48 hours late. Any work submitted more than 48 hours after the deadline **will receive 0 marks.**
- Each student will have 3 "late days" which you may choose to use for the Assignments. There will be no penalty applied for these late days. You do not need to apply for these - any late days you have left will be automatically applied to other assignments that you submit late.
- The late days are intended to cover minor illnesses or other personal reasons for being late. You should only ask for extensions in the case of more significant or longer lasting problems (and you may need documentation). Do not waste "late days" on procrastination!

All submitted code must be compiled and run on the ECS Linux system or on a Mac. You can work on any other platforms, but programs that do not compile and run on the ECS Linux system or Mac will not be marked. Since computer graphics is all about showing results on the screen, projects are marked based primarily on the final output on the display.

Plagiarism

Working Together and Plagiarism

We encourage you to discuss the principles of the course and assignments with other students, to help and seek help with programming details, problems involving the lab machines. However, any work you hand in must be your own work.

The School policy on Plagiarism (claiming other people's work as your own) is available from the course home page. Please read it. We will penalise anyone we find plagiarising, whether from students currently doing the course, or from other sources. Students who knowingly allow other students to copy their work may also be penalised. If you have had help from someone else (other than a tutor), it is always safe to state the help that you got. For example, if you had help from someone else in writing a component of your code, it is not plagiarism as long as you state (eg, as a comment in the code) who helped you in writing the method.

Mandatory Requirements

Computer graphics programming requires both understanding of the necessary mathematical concepts and knowledge of how to employ numerical methods. Therefore, there is a mandatory requirement that you obtain at least 40% on the total of the five assignments, and at least 40% on the exam.

Passing COMP 471

To pass COMP 471, a student must satisfy mandatory requirements and gain at least a **C-** grade overall.

Withdrawal

The last date for withdrawal from COMP 471 with entitlement to a refund of tuition fees is Friday 13 March 2015. The last date for withdrawal without being regarded as having failed the course is Friday 15 May 2015 -- though later withdrawals may be approved by the Dean in special circumstances.

Rules & Policies

Find key dates, explanations of grades and other useful information at http://www.victoria.ac.nz/home/study.

Find out about academic progress and restricted enrolment at http://www.victoria.ac.nz/home/study/academic-progress.

The University's statutes and policies are available at http://www.victoria.ac.nz/home/about/policy, except qualification statutes, which are available via the Calendar webpage at http://www.victoria.ac.nz/home/study/calendar (See Section C).

Further information about the University's academic processes can be found on the website of the Assistant Vice-Chancellor (Academic) at http://www.victoria.ac.nz/home/about/avcacademic

All students are expected to be familiar with the following regulations and policies, which are available from the school web site:

Grievances
Student and Staff Conduct
Meeting the Needs of Students with Disabilities
Student Support
Academic Integrity and Plagiarism
Dates and Deadlines including Withdrawal dates
School Laboratory Hours and Rules
Printing Allocations
Expectations of Students in ECS courses

The School of Engineering and Computer Science strives to anticipate all problems associated with its courses, laboratories and equipment. We hope you will find that your courses meet your expectations of a quality learning

laboratories and equipment. We hope you will find that your courses meet your expectations of a quality learning experience.

If you think we have overlooked something or would like to make a suggestion feel free to talk to your course organiser or lecturer.

Course Outline as PDF