Computer Graphics Rendering - Course Outline

CGRA 408: 2016 Trimester 2

This document sets out the workload and assessment requirements for CGRA 408. 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

By the end of the course, students should be able to:

1. understand and use the computer graphics pipeline to generate photo realistic rendering images (BE 3(a); BSc COMP 4);
2. understand core structures of photo-realistic renderer (e.g. PBRT) for implementing rendering algorithms (BE 3(f); BSc COMP 1);
3. understand important concepts and theory of physically based rendering algorithms and be able to construct programs that use the algorithms (BE 3(a), 3(b), 3(f); BSc COMP 1, 2, 3, 4).

Prescription

Ray tracing. Advanced lighting techniques. Texture mapping and its derivatives. Radiosity. Photon mapping. Advanced shading and lighting techniques on modern graphics cards.

The course focuses mostly on algorithms to create photo-realistic rendering images; it is not a course on creative content creation. We will explore how final images are produced once a 3D model has been created or acquired. Topics include: the graphics rendering pipeline, radiometry, reflection models, texture, lighting, acceleration structures, ray tracing, path tracing, and other global illumination algorithms.

The course is based on the belief that Computer Graphics is best learned by doing. Implementing programs is a significant component of the course because many of the subtleties and difficulties encountered in Computer Graphics only become apparent when one actually tries to write programs and show the results on the display. All projects are strongly related to computer programming and they serve to both increase your understanding of the relevant concepts and techniques, and also to give you confidence in being able to apply the techniques to real applications.

The lectures will assume that students understand the basic computer graphics pipeline (e.g. COMP 308), linear algebra, and have sufficient programming skill.

Textbook

There is no set textbook for CGRA 408, but the following books contain most of the relevant materials covered from the course and are on reserve in VUW library:

- Matt Pharr, Greg Humphreys, "Physically Based Rendering: From Theory to Implementation, 2nd Edition". (E-Book version is also available)
- Peter Shirley, R. Keith Morley, "Realistic Ray Tracing, 2nd Edition". (3-day loan)

Lectures, Tutorials, Laboratories, and Practical work

CGRA 408 is a trimester 2 course. The trimester starts on 11 July. The examination period at the end of the course is 21 October - 12 November.

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

Lectures for CGRA 408 are Monday, Wednesday, and Thursday 10:00 - 10:50am in Von Zedlitz [Kelburn] 108.

Some of the lecture time may be used for tutorials, presentations, and guest lectures. Details will be announced during lectures.

Assignments and Projects

Computer graphics is best learned by doing and showing the results. There will be three projects involving computer programming. The final project consists of both individual and group tasks. Work for marking should be submitted

programming. The final project consists of both individual and group tasks. 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.

Workload

In order to maintain satisfactory progress in CGRA 408, you should plan to spend an average of at least *10* hours per week on this paper. A plausible and approximate weekly breakdown for these hours would be:

- Lectures and tutorials: 2.5 hours
- Readings and presentations: 3.5 hours
- Projects: 4 hours

Note: A 15 point course maps to 150 hours over 15 weeks, where this includes the 12 weeks of lectures, 1 week of mid-trimester break, and 2 weeks of study & exams period.

School of Engineering and Computer Science

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

Staff

The course coordinator and lecturere for CGRA 408 is Taehyun Rhee. The contact details are:

Taehyun Rhee:

- Cotton 330
- +64 4 463 5233 x7088
- taehyun.rhee@ecs.vuw.ac.nz

The class representative: TBA

Announcements and Communication

The main means of communication outside of lectures will be the CGRA 408 web area at https://ecs.victoria.ac.nz/Courses/CGRA408_2016T2/WebHome. There you will find, among other things, this document, the lecture schedule and assignment handouts and course feedback, and the CGRA 408 Forum. The forum is a web-based bulletin board system. Questions, answers, and comments can be posted to the forum. We highly recommend using it for discussion. The staff will read and occasionally respond to the posts.

Assessment

Your grade for CGRA 408 will be determined based on the following assessment weightings:

Item	Weight	Week Due
Project 1	20%	week 5
Project 2	20%	week 8
Final Project	40%	presentation (week 12) report (in the exam period)
Paper Presentation	20%	during week 4 - 12

The final project will be group work in groups of 2~5 students. The number of group members depends on the total number of enrolled students and the project topic. A part of the final project will be done and marked as group. Therefore, we strongly encourage student discussion. A well-collaborated and integrated project will receive more marks. However, most of the assessment will be based on individual contributions. The group marks will be limited to the integrated system and presentation (10%) of the final project; the other 30% of the final project will be assessed individually.

Project 1 contributes to learning objective 1. Project 2 and the final project contribute to learning objectives 1,2, and 3. The paper presentation contributes to learning objective 3.

Practical Work

All the materials for the projects 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.

The policy on late submission is as follows:

- Each 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; we assume the total marks is 100. 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 any project or projects during the course (except the final project). 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 projects 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. You can work on any other platforms, but programs that do not compile and run on the ECS Linux system 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

Both the practical work and an understanding of the concepts and principles of rendering are essential to the course. Therefore, there is a mandatory requirement that you obtain at least 40% on the total of the three projects.

Passing CGRA 408

To pass CGRA 408, you must satisfy the mandatory requirements and gain at least a **C-** grade overall.

Withdrawal

The last date for withdrawal from CGRA 408 with entitlement to a refund of tuition fees is Friday 22 July 2016. The last date for withdrawal without being regarded as having failed the course is Friday 23 September 2016 -- 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