



COMPUTER SCIENCE AND ENGINEERING

DIT226 Computer Graphics, Advanced Course, 7.5 credits

Datorgrafik, fortsättningskurs, 7,5 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Computer Science and Engineering on 2017-02-13 and was last revised on 2017-10-03 to be valid from 2017-10-15, autumn semester of 2017.

Field of education: Science 100%

Department: Computer Science and Engineering

Position in the educational system

The course is part of the Computer Science Master's Programme. It is also a single subject course at the University of Gothenburg.

The course can be part of the following programmes: 1) Computer Science, Master's Programme (N2COS), 2) Applied Data Science Master's Programme (N2ADS), 3) Game Design & Technology Master's Programme (N2GDT) and 4) Computer Science, Bachelor's Programme (N1COS)

Main field of studies

Computer Science

Interaction Design

Specialization

A1F, Second cycle, has second-cycle course/s as entry requirements

A1N, Second cycle, has only first-cycle course/s as entry requirements

Entry requirements

To be eligible for the course, students should have successfully completed courses corresponding to 120 hec within the subject of Computer Science, including the following courses:

- 7.5 hec of linear algebra (MMG20 or equivalent),

- 7.5 hec in data structures (DIT960 or equivalent),
- 15 hec in imperative or object oriented programming (DIT012 and DIT952, or equivalent), and
- 7.5 hec in computer graphics (DIT223 or equivalent),

Applicants must prove knowledge of English: English 6/English B or the equivalent level of an internationally recognized test, for example TOEFL, IELTS.

Learning outcomes

On successful completion of the course the student will be able to:

Knowledge and understanding

- describe and apply advanced algorithms, often at a research level, and processes used to create computer graphics in 3D-games and/or movies,

Competence and skills

- implement advanced algorithms used to generate real-time renderings and photo realistic renderings, or GPU algorithms, as part of a project,
- present and describe one or a few advanced algorithms used in computer graphics,

Judgement and approach

- judge and select suitable algorithms and methods for specific advanced sub problems in computer graphics and/or GPU programming.

Course content

The course aims to deepen and broaden the knowledge about three dimensional computer graphics. It is a follow-up course to an introductory course in computer graphics, that gives the students a chance to dig deeper into particular subjects and also to perform a project.

There will be compulsory seminars, where more details on a research-level will be presented for a selection of topics, e.g.:

- ambient occlusion,
- hair rendering,
- GPGPU applications,
- ray tracing and global illumination,
- advanced path tracing,
- GPU-ray tracing,
- hard and soft shadows,
- real-time indirect illumination,

- spherical harmonics, etc.

The initial seminars are presented by the teacher or other researchers. For the remaining seminars, short presentations are given by the students, followed by group discussions to deepen the understanding of the presented algorithms/techniques. Since the topic is chosen by the presenter, the exact course content varies somewhat for each course instance.

The student will achieve practical experience from a larger project around 3D-graphics (individually or in groups). E.g., the project can be to implement a specific advanced extensive technique or implementing several advanced but smaller techniques. This can, for instance, be done as a render engine of a game or stand-alone programs.

Sub-courses

1. **Project** (*Projekt*), 6 higher education credits
Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)
2. **Seminars** (*Seminarier*), 1.5 higher education credits
Grading scale: Pass (G) and Fail (U)

Form of teaching

Project work, individually or in groups of 2-3 students. Compulsory seminars.

Language of instruction: English

Assessment

To pass the course, the student must have at least 80% attendance at the compulsory seminars, approved student presentation, and approved project. The final grade of the course corresponds to the grade of the project.

The sub-courses are assessed as follows:

- The student presentation is assessed on how well the topic is explained and presented for the target audience, i.e., the other students. The presentations comprise 15 minutes per student and can be performed individually or in groups of 2-3 students.
- The project is assessed on the complexity and magnitude of the implemented graphics techniques and how successfully the project has been performed. The project can be done individually or in groups of 2-3 students and focuses on graphics programming. The requirements for the grades scales linearly with the number of group members. There is no written report, instead the project is displayed and explained to the teacher (e.g., source code and outcomes) by the project member(s) at the end of the course.

If a student, who has failed the same examined component twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

In cases where a course has been discontinued or has undergone major changes, the student shall normally be guaranteed at least three examination occasions (including the ordinary examination) during a period of at least one year from the last time the course was given.

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

Course evaluation

The course is evaluated through meetings both during and after the course between teachers and student representatives. Further, an anonymous questionnaire is used to ensure written information. The outcome of the evaluations serves to improve the course by indicating which parts could be added, improved, changed or removed.

Additional information

The course replaces the DIT221 Advanced Computer Graphics 7,5 hec course. The course cannot be included in a degree which contains DIT221. Neither can the course be included in a degree which is based on another degree in which the course DIT221 is included.

The course is a joint course together with Chalmers.

Course literature to be announced the latest 8 weeks prior to the start of the course.