UNIVERSITY OF GOTHENBURG

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DIT224 Computer Graphics, 7.5 credits

Datorgrafik, 7,5 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Computer Science and Engineering on 2019-02-08 to be valid from 2019-09-02, autumn semester of 2019.

Field of education: Science 100%
Department: Department of Computer Science and Engineering

Position in the educational system

The course is compulsory within the N2GDT Game Design and Technology Master's Programme. It is offered within several programmes. The course is also as a single subject course at the University.

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	*Specialization*
Computer Science	A1F, Second cycle, has second-cycle course/s as entry requirements
Interaction Design	A1F, Second cycle, has second-cycle course/s as entry requirements

Entry requirements

To be eligible for the course, students should have successfully completed courses corresponding to 90 credits within the subject of Computer Science, including the following courses:
- 7.5 credits in data structures (DIT960 or equivalent), and
- 15 credits in imperative or object-oriented programing (DIT012 and DIT952, 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

- state and describe how computer graphics are implemented using a high-level programming language and a typical graphics API such as OpenGL,
- state and describe the fundamental algorithms used to create computer graphics in 3D-games and movies,
- to some extent, state how the current graphics hardware architectures are designed

Competence and skills

- implement algorithms to generate real-time renderings and, to some extent, photo realistic renderings,
- state how to utilize the functionality of dedicated hardware support for graphics through programming interfaces,
- apply some basic mathematics used for solving relevant subproblems, e.g., for intersection tests, lighting computations, object transformations, and ray tracing.

Judgement and approach

- describe fundamental algorithms in 3D graphics and discriminate based on their suitability and efficiency,
- select suitable algorithms, data structures and matehematical methods for specific subproblems in computer graphics.

Course content

The course aims to provide broad knowledge about algorithms for three dimensional computer graphics and also gives the student experience in implementing basic 3D-graphic techniques.

The course provides knowledge of the principles used to create images through computer algorithms. The primary focus is on real-time rendering and photo realistic rendering.

The first part of the course covers real-time rendering, where techniques and data structures for e.g. illumination, special effects, shadows and reflections will be studied.

Design of graphics hardware and speedup algorithms will also be treated.

The second part focus on generating photo-realistic images and includes the studying of algorithms for ray tracing and global illumination. Overall, the course provides explanations and some capabilities to, on a basic level, apply corresponding mathematics, e.g., object and camera transformations, light/material interaction, and intersection tests. For this, linear algebra is used. The course contains some programming tutorials, giving the students practical skills concerning programming for 3D-graphics.

Sub-courses

1. **Written exam** *(Skriftlig tentamen),* 6 credits
   Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)
2. **Laboratory work** *(Laboration),* 1.5 credits
   Grading scale: Pass (G) and Fail (U)

Form of teaching

The course is organized into lectures and exercises. The exercises focus on implementing 3D graphics algorithms using C++. Students are not expected to have preknowledge in C++ but in at least another modern high-level language (e.g., Java, since C++ and Java are rather similar).

Language of instruction: English

Assessment

The course is examined by laborations done in pairs or individually, and a written exam done individually in an examination hall.

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).
A Pass grade (G) for the entire course requires at least a Pass grade for all sub-courses.
To be awarded Pass with Distinction (VG) for a full course, the student must, in addition, receive the grade VG on the sub-course Written exam.

Course evaluation

The course is evaluated through meeting 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 is a joint course together with Chalmers.

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

The course replaces the course DIT223 Computer Graphics, 7.5 credits. The course cannot be included in a degree which contains DIT223. Neither can the course be included in a degree which is based on another degree in which the course DIT223 is included.

It is also recommended that the student has 7.5 credits of linear algebra (MMGD20 or equivalent), but this is not a strict requirement.