Course Overview

Computer Graphics
Instructor: Sungkil Lee

Course Webpage

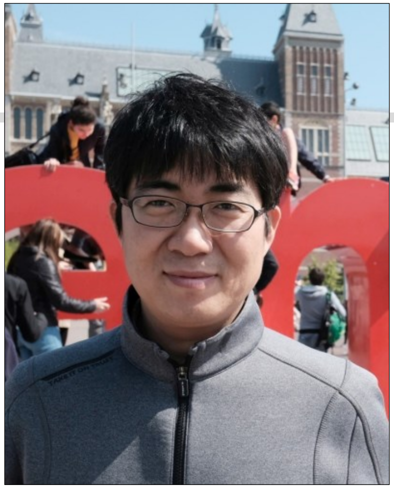
- **The official syllabus can be downloaded from the course webpage as well as GLS.**
  - This slide is an extended version of the official syllabus.

- **Course web page: http://cg.skku.edu/course/cg/**

ID: cg
password: skku

  - All the written course materials will be announced on the web.
  - Various resources concerning this course will be also available.
  - Check the web page regularly.
  - Only videos and assignment submission will use i-campus.

Who am I?



- **Sungkil Lee, Ph.D.**
  - Associate Professor, Department of Software
  - Director, Computer Graphics Lab.
- **Unofficially, ...**
  - Expert in real-time GPU rendering
  - High-end C++ programmer
  - many others ...

TAs and Office Hour

- **Teaching assistants (TAs):**
  - Cho, Hoonmin (조훈민), 27336

- **Office hour**
  - Tuesday 13:15-14:15, at my office (27328)
  - During the office hour, I will provide real-time feedback for emails.

Contacts

- **I will answer questions for the official course email.**
  - The official course email: **cg_g@g.skku.edu**
  - This email address is shared with me and all of the TAs.
  - This way is the fastest way to reach us.

- **I will not answer for:**
  - non-email contacts (e.g., do not use iCampus messaging).
    - I do not regularly check the iCampus messaging.
  - emails:
    - sent to my private address (not shared with the TA).
    - sent outside working times and days (e.g., emails sent during the weekend).
    - when any of the sender or recipients are not identified.

Email Examples

- **Korean version**

[cg41] A1 채점 오류에 관한 문의

컴퓨터그래픽스 수업 조교님 (or xxx 조교님, or 이성길 교수님),

저는 학부 (또는 대학원) 컴퓨터그래픽스 수업을 수강하고 있는 홍길동입니다.
제 학번은 xxxxxxxxx 입니다.

다름이 아니라, 이번 숙제 A1 채점에 문의드릴 것이 있습니다.
제가 xxx를 구현하였는데, 채점에 반영되지 않은 것 같습니다.
착오가 없는지 확인을 부탁드립니다.

홍길동 드림

- 제목과 본문에 본인의 정보와 주제를 포함하고, 구체적으로 작성한다.
- 본문 시작에 반드시 수신자의 이름을 넣는다.
- 마지막에 본인의 이름을 넣고 드림 (또는 올림/배상)으로 마무리한다.
  - 드림: 본인의 지위보다 높거나, 같거나, 낮은 경우, 올림/배상: 본인의 지위보다 높은 경우

Email Examples

- **English version**

[cg41] Inquiry on A1 rating

Dear TA (or professor),

This is Gildong Hong who is taking the computer graphics course. My student ID is xxxxxxxxx.

I would like to ask you about the rating of the first assignment, A1. I am sure that I did ..., but ....
Would it be possible for you to check if there is a mistake in the rating?

Best regards,
Gildong Hong

Languages

- **English section**
  - Basically, most of the lecture will be given in English.
  - But, when it is considered too complex or hard to explain, Korean can be also used for Korean students.

- **For exams, assignments, and presentations:**
  - Make sure to use English.
  - If you write in Korean, you do not get credits for that.

Course Summary

- **Implication of CG**
  - Computer graphics is a fundamental tool for creating and manipulating visual media including games, animation, virtual reality, and web, and is also a crucial component for science and engineering software.

- **What to cover**
  - This course covers basic theory and practical techniques of computer graphics for digital media.

- **Particulars in this course**
  - This course particularly deals with modern-style shader programming for its implementation.

What you will learn in this course

- **Algorithms for creating realistic images**

- **Having fun improving your C++ programming skills**
  - CG is one of the most appropriate topics for object-oriented C++ programming.
  - You will also learn how to use third-party libraries.

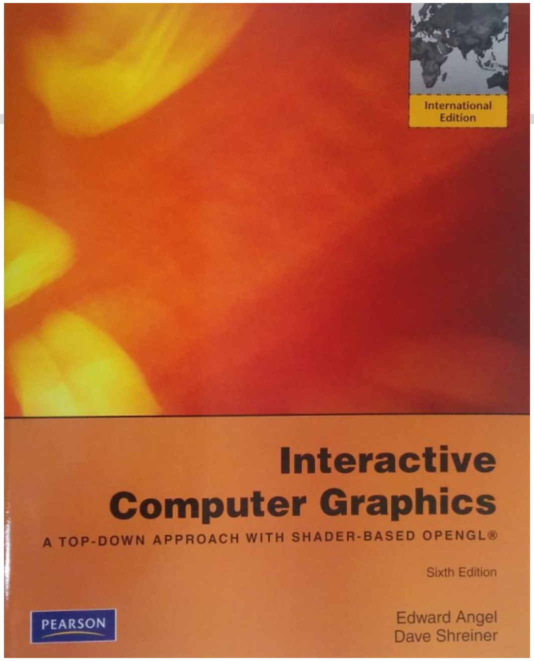
- **GPU programming**
  - The concepts of OpenGL programming
  - This course is a *very unique class that covers modern-style OpenGL* which utilizes the power of modern GPU.
  - The basic knowledge of GPU programming can be easily extended to mobile graphics (e.g., OpenGL ES) and general-purpose GPU programming (e.g., CUDA, OpenCL).

Prerequisites

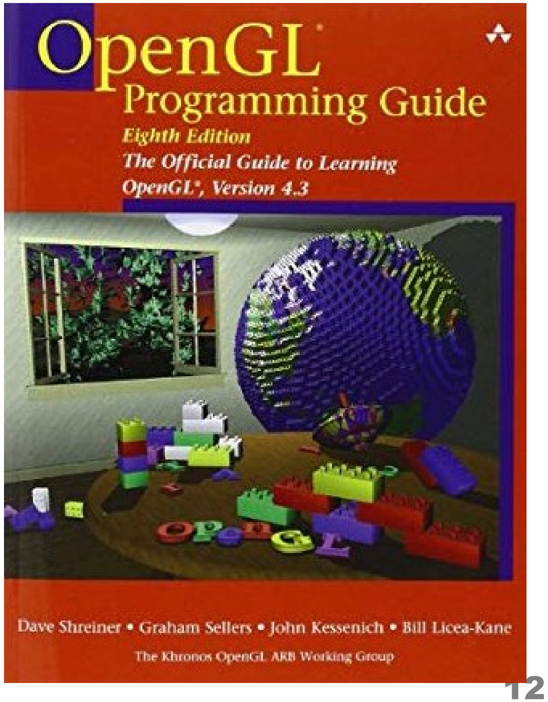
- **Data structures, Algorithms**
  - The core of CG can be effective data structures and algorithms for computing realistic imagery, which can be also parallelized.
  - If you did not learn data structures or algorithms, I recommend taking the course after having them first.
- **C++**
  - The concept of object-oriented programming
  - The concept of event-driven programming
  - Still one of the most powerful languages for high-performance computing
- **Linear Algebra**
  - The basics of vector and matrix manipulation
  - Mostly high-school algebra

Textbook and References

- **Textbook**
    - Interactive Computer Graphics: A Top-Down Approach with Shader-Based OpenGL
    - Edward Angel and Dave Shreiner
    - 6th Edition, 2011


International Edition
Interactive Computer Graphics
A TOP-DOWN APPROACH WITH SHADER-BASED OPENGL®
Sixth Edition
PEARSON
Edward Angel
Dave Shreiner

- **References**
    - OpenGL Programming Guide: The Official Guide to Learning OpenGL, Versions 4.3 or later} (aka Red Book). Dave Shreiner, 2013.
    - http://www.opengl.org/


OpenGL
Programming Guide
Eighth Edition
The Official Guide to Learning OpenGL®, Version 4.3
Dave Shreiner • Graham Sellers • John Kessenich • Bill Licea-Kane
The Khronos OpenGL ARB Working Group

Grading Policy

- **General grading rule**
  - In general, hard-working students will get a good grade.
  - *Programming assignments* are very important throughout the course.

- **Organization**
  - Attendance and *attitude*: 10 %
  - Assignments: 60%
  - Team Projects (Final exam): 30%

Attendance Policy

- **Rules**
  - When you are absent **6 times or less** (a week has two lectures), the absence has no effect on your grade. Otherwise (**absent more than 6 times**), you get graded F.
    - One late attendance is equivalent to a half absence.
  - When you miss the final exam, you will fail to pass this course.
  - Absence will be considered presence, given a valid proof only for the following exceptions.

- **The only exceptions for attendance:**
  - You are in the quarantine associated with Covid19 virus.
  - Your family passed away.

Desired Attitudes for this Course

- **This course is ~~not~~ an easy-going one.**
  - You will learn a lot of unique stuffs, unavailable from other courses.
  - Participate the course actively.

- **Basic etiquette**
  - Attend in time.
  - When you are late, please enter in a side door to avoid an interruption.
  - Lecture recording without my permission is not allowed.
  - Please take off slippers and hat/caps during the lecture.

No Cheating!

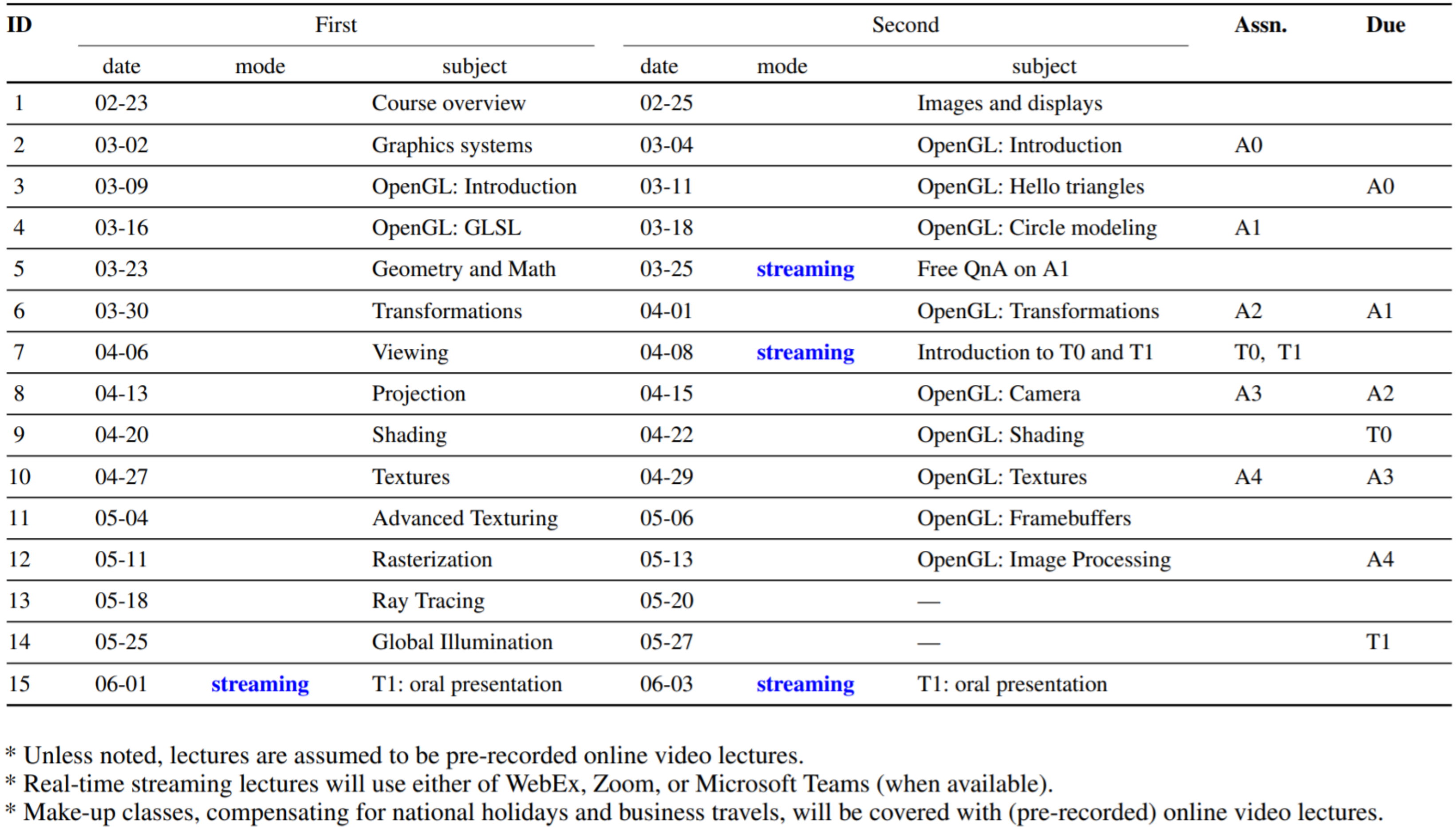
- **Any cheating = You get graded F**
  - For many years, I have found a lot of different cases.
  - If cheating is found in any cases, you will not pass this course.

- **Cheating in assns. and exams**
  - Many of the assignments are available from the last year ones.
  - All of the assignments are intended to improve your programming skills. Hence, do it on your own. It will significantly raise your value.

- **Cheating in attendance**
  - when you attend for your friends or remotely;
  - when you left after attendance check (without my permission);
    - I will often manually check attendance.
  - for any other unacceptable cases.

Agenda

- **The course will basically follow the schedule below:**



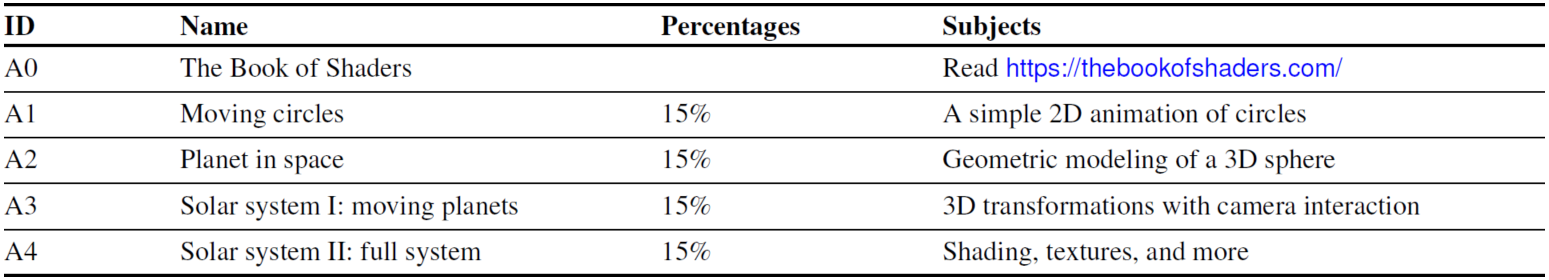
ID	First			Second			Assn.	Due
	date	mode	subject	date	mode	subject		
1	02-23		Course overview	02-25		Images and displays		
2	03-02		Graphics systems	03-04		OpenGL: Introduction	A0	
3	03-09		OpenGL: Introduction	03-11		OpenGL: Hello triangles		A0
4	03-16		OpenGL: GLSL	03-18		OpenGL: Circle modeling	A1	
5	03-23		Geometry and Math	03-25	streaming	Free QnA on A1		
6	03-30		Transformations	04-01		OpenGL: Transformations	A2	A1
7	04-06		Viewing	04-08	streaming	Introduction to T0 and T1	T0, T1	
8	04-13		Projection	04-15		OpenGL: Camera	A3	A2
9	04-20		Shading	04-22		OpenGL: Shading		T0
10	04-27		Textures	04-29		OpenGL: Textures	A4	A3
11	05-04		Advanced Texturing	05-06		OpenGL: Framebuffers		
12	05-11		Rasterization	05-13		OpenGL: Image Processing		A4
13	05-18		Ray Tracing	05-20		—		
14	05-25		Global Illumination	05-27		—		T1
15	06-01	streaming	T1: oral presentation	06-03	streaming	T1: oral presentation		

* Unless noted, lectures are assumed to be pre-recorded online video lectures.
* Real-time streaming lectures will use either of WebEx, Zoom, or Microsoft Teams (when available).
* Make-up classes, compensating for national holidays and business travels, will be covered with (pre-recorded) online video lectures.

Programming Assignments

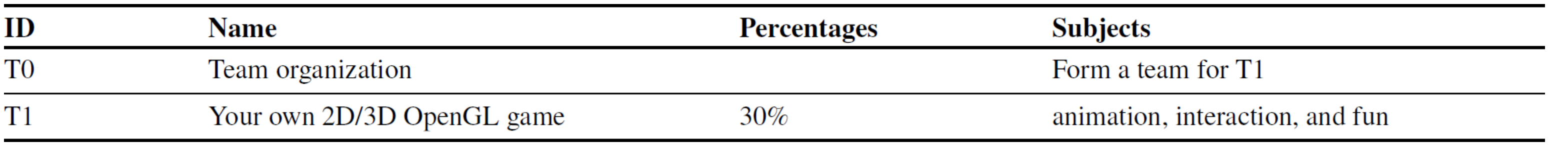
- **Five assignments in total will be given in the course.**
  - They are designed for step-by-step improvements, leading from geometric modeling to a more complex 3D animation.
  - When you follow the schedule step by step, they will be in an acceptable level of difficulty.
  - A submission due for each is usually given 2-3 weeks in most cases.
  - You may need to fully spend at least 3 to 4 days for each.

- **Subjects**



ID	Name	Percentages	Subjects
A0	The Book of Shaders		Read https://thebookofshaders.com/
A1	Moving circles	15%	A simple 2D animation of circles
A2	Planet in space	15%	Geometric modeling of a 3D sphere
A3	Solar system I: moving planets	15%	3D transformations with camera interaction
A4	Solar system II: full system	15%	Shading, textures, and more

Team Project (Final Exam)



ID	Name	Percentages	Subjects
T0	Team organization		Form a team for T1
T1	Your own 2D/3D OpenGL game	30%	animation, interaction, and fun

- **Finding members (T0)**
  - A team can consist of one, two, or three students.
  - If you do not find a partner, you have to do it alone.

- **One team project (T1) has to be done.**
  - You can make a 2D or 3D game written in OpenGL.
  - You can apply advanced stuffs and your own creativity and fun.
  - You need to orally present/demonstrate T1 at the end of the semester.

Any questions?