

# **Course Overview**

**Computer Graphics**  
**Sungkil Lee**

# Who am I?

- **Sungkil Lee (이성길), Ph.D.**

- Full Professor, Department of Software
- Director, Computer Graphics Lab.
- Postdoc., Max-Planck-Institut fuer Informatik (2009-2011)
- Visiting professor, Delft University of Technology (2017)



- **Research interests**

- Real-time GPU rendering
- Deep learning and rendering
- GPU algorithms
- Virtual Reality (VR)
- Optics
- Global illumination

# Course Webpage

- **Course web page:** <http://cg.skku.edu/course/cg/>
  - Written course materials are distributed on the web.
  - Use the following account to access the course web page.

**ID = cg, password = skku**

- **i-campus**
  - Video lectures and assignment submissions use i-campus.
- **Real-time streaming: Zoom 336 130 6812 (password: skku)**
  - When the lecture uses streaming, join using the Zoom.

# TAs

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- **Teaching assistants (TAs):**
  - Janghun Kim (김장훈), 27336
  - Hyogeun Byun (변효근), 27336
  - Moonsoo Jeong (정문수), 27336

# Contacts

- **I will answer questions for the official course email:**

[cg\\_g@g.skku.edu](mailto:cg_g@g.skku.edu)

- The contact to me should be shared with TAs.
- This way is the fastest way to reach us.

- **I will not answer for:**

- Non-email contacts (e.g., [i-campus messaging](#)).
  - I do not check the i-campus messaging.
- Other 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**

<b>채점 오류에 관한 문의</b>
컴퓨터그래픽스 수업 조교님 (or xxx 조교님, or 이성길 교수님),
저는 학부 (또는 대학원) 컴퓨터그래픽스 수업을 수강하고 있는 홍길동입니다. 제 학번은 xxxxxxxxxx 입니다.
다름이 아니라, 이번 숙제 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**

<b>Inquiry on the assignment rating</b>
<p>Dear TA (or professor),</p> <p>This is Gildong Hong who is taking the computer graphics course. My student ID is xxxxxxxxx.</p> <p>I would like to ask you about the rating of the first assignment. I am sure that I did ..., but ....</p> <p>Would it be possible for you to check if there is a mistake in the rating?</p> <p>Best regards, Gildong Hong</p>

# Email Examples

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- **Further instructions on emails**

- 조교나 교수에게 email을 수신한 경우는 반드시 수신 여부를 답장하기 바랍니다.
- 수신 여부와 함께 email에서 이해한 내용을 요약하여, 이해의 여부를 알리는 것도 필요합니다.
- You have acknowledge to the sender again to make sure the sender knows you got the email reply without problem.
- Also, it is better to show the brief summary of your understanding.



# 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.

- **Korean section**

- 수업의 자료 언어는 영어를 사용한다.
- 수업을 위한 설명은 한국어와 영어를 함께 사용한다.
- 학생의 시험, 과제, 발표는 한국어를 사용한다; 영어를 사용해도 된다.

# Course Summary

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- **Implication of CG**

- Computer graphics (CG) 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 CG for digital media.

- **Particulars in this course**

- This course deals with GPU shader programming for its implementations.

# What you will learn in this course

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- **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.
- **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).

# Textbook and References

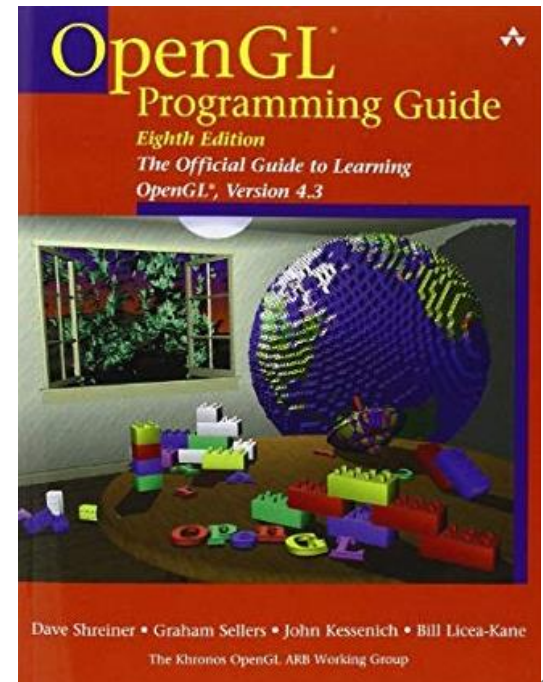
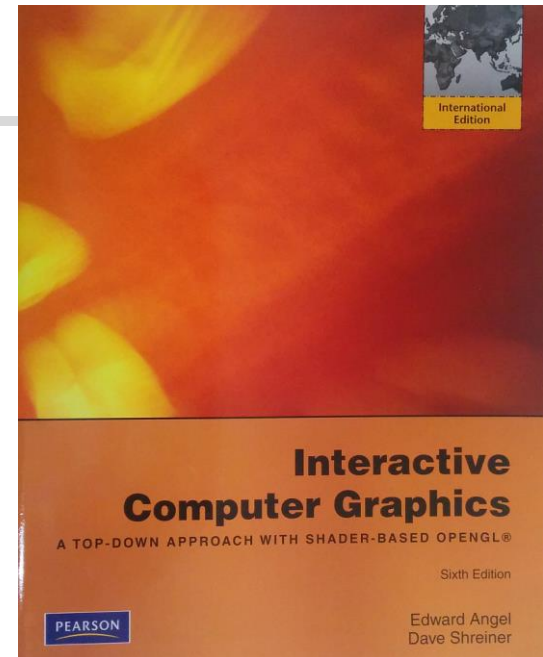
- **Textbook**

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

- **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/>



# Prerequisites

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- **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.

- **Programming: C/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

# Programming Platform: Windows

- **Default platform**

- (O) Windows 10/11 + Visual Studio + OpenGL
- NVIDIA GeForce GPUs and Intel CPUs

- **Alternative platform**

- (O) Linux/Ubuntu + GCC + OpenGL
- A universal *makefile* is provided for samples.

- **Non-supported platforms**

- (X) MacOS or iOS
- OpenGL does not work well with virtual machine.
- If you really want to do programming only in Mac, I recommend you dropping this course.

# Grading Policy

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- **General grading rule**

- In general, hard-working students will get a good grade.
- Programming assignments are important throughout the course.
- **If you do not apply for the final exam, you get graded F.**

- **Organization**

- Attendance: 10 %
- Assignments: 60%
- Final exam: 30%

# Attendance Policy

- **How to check attendance:**

- <https://icampus.skku.edu> for online materials.
- <https://attend.skku.edu/> for offline lectures.

- **Rules**

- You fail to pass this course, when being absent more than **6 times** (*a week has two lectures*). *Otherwise, the absence has no effect on your grade*, regardless of the number of absence.
- Late attendance is equivalent to a half absence for offline lectures, but not allowed for online lectures.
- Absence will be considered presence, *given a valid proof* only for the following exceptions.
  - 1) You are in the quarantine associated with Covid19;
  - 2) Your family passed away;
  - 3) military services (offline lectures only);
  - 4) official activities for departments, colleges, and the university (offline lectures only).



# No Cheating!

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- **You get graded F := Any cheating**
  - 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**
  - 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	08-29		Course overview	08-31		Images		
2	09-05		Graphics systems	09-07		OpenGL: Introduction		
3	09-12	video	OpenGL: Hello triangles	09-14		OpenGL: Hello triangles		
4	09-19	video	OpenGL: GLSL	09-21	video	OpenGL: Circle modeling		
5	09-26		A1 and QnA	09-28	video	Geometry	A1	
6	10-03	video	Transformations	10-05	video	OpenGL: Transformations		
7	10-10	video	Viewing	10-12		A2 and QnA	A2	A1
8	10-17		Projection	10-19	video	OpenGL: Camera		
9	10-24		Shading	10-26	video	OpenGL: Shading	A3	A2
10	10-31		Textures	11-02	video	OpenGL: Textures		
11	11-07		Advanced texturing	11-09		Framebuffers	A4	A3
12	11-14	video	OpenGL: Framebuffers	11-16	video	OpenGL: Image processing		
13	11-21		Deferred Rendering	11-23		Ray tracing		A4
14	11-28		Ray tracing	11-30		Wrap-up		
15	12-05		Final Exam	12-07		—		

# Assignments

ID	Name	Percentages	Subjects
A1	Moving circles	15%	Simple 2D animation of circles
A2	Planet in space	15%	Geometric modeling of a 3D sphere
A3	Moving planets	15%	3D transformations with camera interaction
A4	Solar system	15%	Shading, textures, and more

- **Four 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 weeks in most cases.
  - You may need to fully spend at least 2 days for each.

# Copyright Notice

- ***Do not upload your homework to a public GitHub repository.***
  - You will be given many example source code from this course.
  - Most of the examples, including skeleton libraries, are fully written by Sungkil Lee. I have spent substantial time and efforts to maintain high-quality examples.
  - The examples are only for the attendees of the course. So, do not make it public in repositories (such as GitHub or other similar repositories). When you upload assignments, you lead other students to potential cheating, which is ethically wrong and is a serious problem.
  - If you need version control, then just upload your code to a private repository; GitHub already provides pro accounts for students for free.

## • 확진 시

- 일단, 학교 프로세스를 따르고, 반드시 담당 교수에게 알린다.
- 최소 1주 또는 격리 해제시까지 출석 불가 (2주 이상 추천)
- 출석 인정: 확진 또는 격리 필요 증빙 제출시

## • 격리 중 수업 참석: Zoom을 이용한 streaming 참석

- 출석은 Zoom 참석했을 경우, 수동으로 확인함
- Zoom streaming은 확진자가 있는 경우만 진행하고, 교수에게 알리지 않은 경우는 streaming을 진행하지 않음.