


# NUS SOC Summer Workshop 2024


Media, Analytics & AI


## Real-Time Graphics Rendering

### Course Information


#### **Pre-requisites**

 Which year of study is appropriate for your topic?  
Students need to have good foundation in basic data structures and algorithms. For most computer science undergraduate programmes, this would be after their first year of studies.


 What background and programming languages are required for your topic?  
Students need to have good foundation in basic data structures and algorithms. It would be a plus if students already know basic C/C++ (not mandatory).

 What do you think is attractive/unique about your topic to students?  
Besides learning the principles of real-time graphics rendering, students will also write shaders to program the GPU to produce graphics effects.

#### **Learning content and Teaching**

 What will be covered during “trial” lectures?  
The trial lectures will cover a preview of the lab assignments and group projects, detailed course schedule, and the following topics on the basics of real-time computer graphics:

- Introduction to Real-time Computer Graphics
- Elementary OpenGL Programming

 What will be covered during the “advanced” seminars?  
After the trial lectures, this course consists of daily lectures to cover the following more advanced topics on real-time graphics rendering:

- Input and Interaction
- Geometric Objects & Transformations

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- Camera & Viewing
- Rasterization & Hidden-Surface Removal
- Illumination and Shading
- Introduction to Modern OpenGL
- Geometric Transformations & Viewing Revisited
- OpenGL Shading Language
- Texture Mapping
- Example Shaders
- FBO & Shadow Mapping
- Post-Rendering Image Processing
- Basic Real-Time Raytracing
- Deferred Shading & Screen-Space Techniques
- Geometry Shader

👤 What will be the nature of the project work? How do you intend to split students into project groups, each consisting of 3 or 4 students?

This course consists of daily lectures for the whole course period, with 3 individual lab assignments and 2 group lab assignments. Each group comprises 3 students.

👤 Do you have any recommendations for references (books) students can study to prepare for your topic before coming to NUS?

Students can prepare themselves by reading the following books (optional) on the basics of computer graphics:


- [The OpenGL Programming Guide](#) (The Redbook), Addison-Wesley
  - 2<sup>nd</sup> Edition is freely available online at <http://www.glprogramming.com/red/>
- [Interactive Computer Graphics: A Top-Down Approach Using OpenGL](#), 5<sup>th</sup> Edition
  - by Edward Angel

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 Besides their own personal laptops, what other equipment or software would students need for your topic?

Students will need Visual Studio 2017 (or later) for the lab assignments. Students can download and install the free Visual Studio Community edition.

### **Assessment**

 What forms of assessment will there be?

Assessment consists of 3 individual lab assignments and 2 group lab assignments.