# COSC422 Advanced Computer Graphics

## Course Outline (Semester 2, 2012)

The field of computer graphics has evolved rapidly over the past decade, and underlying this enormous activity is a large collection of novel algorithms and techniques developed for modeling, real-time rendering and animation. This course covers some of these advanced concepts and algorithms that are important in the design of graphics applications such as photorealistic rendering of three-dimensional scenes and character animations. The course assumes a good knowledge of fundamental methods in computer graphics. Current research areas in graphics and games programming are also discussed.

### Prerequisites

- COSC363 or equivalent.

### Tentative Lecture Plan

- Week 1: Mesh Processing Algorithms
- Week 2: Scene Graphs: Hierachical Modelling and Transformations
- Week 3: Generalized Rotational Transforms: Quaternions, Spherical Interpolation
- Week 4: Forward and Inverse Kinematics
- Week 5: Skeletal Animation: Vertex Skinning, Vertex Blending
- Week 6: Illumination Models: Phong Illumination, BRDF, Cook-Torrance Models
- Week 7: Global Illumination: Radiosity Equations, Form Factors
- Week 8: OpenGL Shader Programming: Vertex and Fragment Shaders
- Week 9: Non-Photorealistic and Image Based Rendering
- Week 10: Spatial Data Structures, Acceleration Algorithms, Collision Detection

### Lecturer and Course Supervisor:

Dr. R. Mukundan
Temporary Office: 340, Level 3, Erskine Bldg.
Email: mukundan@canterbury.ac.nz

### Lecture Hours:

There will be two 1-hour lecture sessions per week. The course will be offered during the first 10 weeks of Semester 2. The lecture timetable will made available shortly before the commencement of the course.

### Course Assessment

- Assignment 1: 25% **(Due: TBA)**
- Assignment 2: 25% **(Due: TBA)**
- Test (Closed book): 50% (Time, Venue: TBA)

No assignments will be accepted after the drop-dead date. The penalty for the late submission of an assignment will be an absolute deduction of 15% of the maximum possible mark.

The Computer Science department has the following grading policy. In order to pass a course you must meet two requirements:

a) The university has adopted a common scale for converting marks to grades. According to this scale, an average mark of 50% is sufficient to pass the course (i.e. to achieve a C-), with an average mark of 55% a C grade is achieved and so forth. We apply this conversion scale to the average marks students achieve over all assessment items.

b) You must achieve an average mark of at least 45% on invigilated assessment items.

Marks are sometimes scaled to achieve consistency between courses from year to year.

## Reference Books:

Tomas Moller, **Real-Time Rendering** , A K Peters 2008.

R. Mukundan, **Advanced Methods in Computer Graphics**, Springer, 2012.

Tom McReynolds, **Advanced Graphics Programming Using OpenGL**, Morgan Kaufmann, 2005.

Randi J. Rost, **OpenGL Shading Language (2nd Ed.),** Addison Wesley, 2006.

## Course Webpage:

http://learn.canterbury.ac.nz/ : The course webpage contains lecture materials, supplementary reading materials and links to useful resources for each topic covered in the course.

## Other Important Documents:

Important information for 4th Year CSSE Students:

http://www.cosc.canterbury.ac.nz/teaching/4thyear/iho400/handout-400-2011.pdf

There are several important documents available online about departmental regulations, policies and guidelines at the following site. We expect all students to be familiar with these (http://www.cosc.canterbury.ac.nz/regulations/ )

Notices about this class will be posted to the class forum in the Learn system (learn.canterbury.ac.nz). COSC students will also be made members of "CSSE Notices", where general notices will be posted that apply to all classes (such as information about building access or job opportunities).