



**MONASH** University  
Information Technology

**FIT3088**  
**Computer graphics**

**Unit Guide**

**Semester 2, 2013**

The information contained in this unit guide is correct at time of publication. The University has the right to change any of the elements contained in this document at any time.

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# **FIT3088 Computer graphics - Semester 2, 2013**

Computer graphics is concerned with the creation of synthetic images and virtual worlds. This unit introduces the essential algorithms, theory and programming concepts necessary to generate interactive 2D and 3D graphics. Students will gain practical experience using the industry standard OpenGL API to develop their own interactive graphics applications. The topics covered form the basis of core knowledge necessary for developing applications in scientific visualisation, virtual reality, visual special effects and computer games.

## **Mode of Delivery**

Clayton (Day)

## **Contact Hours**

2 hrs lectures/wk, 2 hrs laboratories/fortnight

## **Workload requirements**

For on campus students, workload commitments are:

- two-hours of lectures each week, and
- two-hour laboratory class each fortnight
- a minimum of 3-4 hours of personal study per one hour of contact time in order to satisfy the reading and assignment expectations.
- You will need to allocate up to 5 hours per week in some weeks, for use of a computer and assignment work.

## **Unit Relationships**

### **Prohibitions**

CSE3313, DGS3622, FIT3005, GCO3817

### **Prerequisites**

FIT2004 or CSE2304

### **Chief Examiner**

Dr Peter Tischer

### **Campus Lecturer**

**Clayton**

**Peter Tischer**

# Academic Overview

## Learning Outcomes

At the completion of this unit students will have -A knowledge and understanding of:

- mathematical representations of basic geometric primitives in Euclidean space, such as points, lines, polygons and parametric curves;
- how to use homogeneous co-ordinates and transformations on geometric objects in two and three dimensions.
- how to combine multiple transformations efficiently;
- orthographic, parallel and perspective projections and their related homogeneous transformations;
- appropriate data structures for hierarchical representation of polygonal datasets;
- rasterisation algorithms for drawing in frame buffers;
- the use of Quaternions to represent object rotation;
- a synthetic camera model for viewing and projecting of two and three-dimensional geometry;
- algorithms for hidden surface removal and backface elimination. The capacity to analyse the space and time complexity of these algorithms to determine the most appropriate in a given situation;
- BRDF Shading models such as Lambert, Phong, Blinns Phong, Torrance-Sparrow-Blinn-Cook-Beckmann, Oren-Nayar;
- textures and texture mapping;
- basic knowledge of aliasing theory;
- interpolative shading models. Shadow algorithms. Local and global illumination models;
- the OpenGL state-machine, GPUs and graphics pipeline.

Developed attitudes that enable them to:

- understand the role and value of visual communication in the arts and sciences;
- appreciate the uses and application of interactive, real-time graphics and software rendering.

Developed the skills to:

- program basic interactive graphics applications in OpenGL;
- apply computer graphics theory and algorithms to the design of visual computing applications.

## Unit Schedule

Week	Activities	Assessment
0	Orientation week: No formal assessment or activities are undertaken	No formal assessment or activities are undertaken in week 0
1	Course Overview, Introduction, History	
2	Displays, 2D Graphics with Processing	
3	2D Transforms, Homogeneous Transforms	
4	OpenGL I, OpenGL II	
5	OpenGL III, 3D Graphics Introduction	
6	3D Transforms, Compound Transforms	
7	Perspective, OpenGL Viewing	Assignment 1 due Week 7, Monday 9 September 2013
8	3D Viewing, Hidden Surface Removal I	
9	Hidden Surface Removal II, Lighting	
10	Texturing, OpenGL Compositing/Animation	
11	Phong Shading, Global Illumination	
12	Developments in CG Research, Exam Revision	Assignment 2 due Week 12, Monday 21 October 2013
	SWOT VAC	No formal assessment is undertaken in SWOT VAC
	Examination period	LINK to Assessment Policy: <a href="http://policy.monash.edu.au/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html">http://policy.monash.edu.au/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html</a>

\*Unit Schedule details will be maintained and communicated to you via your learning system.

## Assessment Summary

Examination (3 hours): 70%; In-semester assessment: 30%

Assessment Task	Value	Due Date
Assignment 1: 2D Graphics	10%	Week 7, Monday 9 September 2013
Assignment 2: 3D Graphics	20%	Week 12, Monday 21 October 2013
Examination 1	70%	To be advised

Unit Schedule

## **Teaching Approach**

### **Lecture and tutorials or problem classes**

This teaching and learning approach provides facilitated learning, practical exploration and peer learning.

# Assessment Requirements

## Assessment Policy

Faculty Policy - Unit Assessment Hurdles

(<http://www.infotech.monash.edu.au/resources/staff/edgov/policies/assessment-examinations/unit-assessment-hu>)

Academic Integrity - Please see the Demystifying Citing and Referencing tutorial at

<http://lib.monash.edu/tutorials/citing/>

## Assessment Tasks

### Participation

- **Assessment task 1**

**Title:**

Assignment 1: 2D Graphics

**Description:**

Programming assignment 1: 2D graphics with Processing

**Weighting:**

10%

**Criteria for assessment:**

Adherence to the specification; quality of programming: robustness, efficiency, correctness; correct implementation of required and optional features; adequate documentation; Creativity and innovation of solution; Quality of graphics code.

**Due date:**

Week 7, Monday 9 September 2013

- **Assessment task 2**

**Title:**

Assignment 2: 3D Graphics

**Description:**

Programming assignment 2: 3D graphics with OpenGL

**Weighting:**

20%

**Criteria for assessment:**

Adherence to the specification; quality of programming: robustness, efficiency, correctness; correct implementation of required and optional features; adequate documentation; Creativity and innovation of solution; Quality of graphics code.

**Due date:**

Week 12, Monday 21 October 2013

## Examinations



## Assessment Requirements

### • Examination 1

**Weighting:**

70%

**Length:**

3 hours

**Type (open/closed book):**

Closed book

**Electronic devices allowed in the exam:**

None

## Learning resources

### Reading list

#### Highly Recommended

Slater, Mel et. al.: Computer Graphics and Virtual Environments: from realism to real-time, Addison Wesley, 2002.

Hearn, Donald and M. Pauline Baker: Computer Graphics with OpenGL (3rd International Edition), Pearson Prentice Hall, 2004

Angel, Edward: OpenGL: A Primer, (2nd Edition) Addison Wesley, 2004.

#### Supplementary Reading

Van Verth, James M. and Lars M. Bishop: Essential Mathematics for Games and Interactive Applications, A Programmers Guide, Morgan Kaufmann, 2004.

Shreiner, D. et. al.: OpenGL Programming Guide (5th Edition), The Official Guide to Learning OpenGL, Version, Addison Wesley 2006.

Angel, Edward: Interactive Computer Graphics: A top-down approach using OpenGL (3rd Edition), Addison Wesley, 2003.

Hill, F.S. Jr.: Computer Graphics Using Open GL (2nd Edition), Prentice-Hall, 2001.

Monash Library Unit Reading List

<http://readinglists.lib.monash.edu/index.html>

### Feedback to you

Types of feedback you can expect to receive in this unit are:

- Informal feedback on progress in labs/tutes
- Graded assignments with comments

## Extensions and penalties

Submission must be made by the due date otherwise penalties will be enforced.

You must negotiate any extensions formally with your campus unit leader via the in-semester special consideration process: <http://www.monash.edu.au/exams/special-consideration.html>

## Returning assignments

Students can expect assignments to be returned within two weeks of the submission date or after receipt, whichever is later.

## Assignment submission

It is a University requirement (<http://www.policy.monash.edu/policy-bank/academic/education/conduct/plagiarism-procedures.html>) for students to submit an assignment coversheet for each assessment item. Faculty Assignment coversheets can be found at <http://www.infotech.monash.edu.au/resources/student/forms/>. Please check with your Lecturer on the submission method for your assignment coversheet (e.g. attach a file to the online assignment submission, hand-in a hard copy, or use an online quiz). Please note that it is your responsibility to retain copies of your assessments.

## Online submission

If Electronic Submission has been approved for your unit, please submit your work via the learning system for this unit, which you can access via links in the my.monash portal.

## Required Resources

Please check with your lecturer before purchasing any Required Resources. Limited copies of prescribed texts are available for you to borrow in the library, and prescribed software is available in student labs.

Processing: available from <<http://www.processing.org>>

Jogl (Java OpenGL): available from <<http://java.net>>

The Java Development Kit (JDK): available from <<http://www.java.com>>

Any machine with OpenGL or MESA installed (see: <<http://www.opengl.org>>).

## Other Information

### Policies

Monash has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and to provide advice on how they might uphold them. You can find Monash's Education Policies at:

[www.policy.monash.edu.au/policy-bank/academic/education/index.html](http://www.policy.monash.edu.au/policy-bank/academic/education/index.html)

Key educational policies include:

- Academic integrity;  
<http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-academic-integrity-policy.html>
- Assessment in Coursework Programs;  
<http://www.policy.monash.edu/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html>
- Special Consideration;  
<http://www.policy.monash.edu/policy-bank/academic/education/assessment/special-consideration-policy.html>
- Grading Scale;  
<http://www.policy.monash.edu/policy-bank/academic/education/assessment/grading-scale-policy.html>
- Discipline: Student Policy;  
<http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-discipline-policy.html>
- Academic Calendar and Semesters; <http://www.monash.edu.au/students/dates/>
- Orientation and Transition; <http://intranet.monash.edu.au/infotech/resources/students/orientation/>
- Academic and Administrative Complaints and Grievances Policy;  
<http://www.policy.monash.edu/policy-bank/academic/education/management/complaints-grievance-policy.html>
- Code of Practice for Teaching and Learning;  
<http://www.policy.monash.edu.au/policy-bank/academic/education/conduct/suppdocs/code-of-practice-teaching-and-learning.html>

### Graduate Attributes Policy

<http://www.policy.monash.edu/policy-bank/academic/education/management/monash-graduate-attributes-policy.html>

### Student services

The University provides many different kinds of support services for you. Contact your tutor if you need advice and see the range of services available at <http://www.monash.edu.au/students>. For Sunway see <http://www.monash.edu.my/Student-services>, and for South Africa see <http://www.monash.ac.za/current/>.

### Monash University Library

The Monash University Library provides a range of services, resources and programs that enable you to save time and be more effective in your learning and research. Go to [www.lib.monash.edu.au](http://www.lib.monash.edu.au) or the library tab in [my.monash](#) portal for more information. At Sunway, visit the Library and Learning Commons at <http://www.lib.monash.edu.my/>. At South Africa visit <http://www.lib.monash.ac.za/>.

## Disability Liaison Unit

Students who have a disability or medical condition are welcome to contact the Disability Liaison Unit to discuss academic support services. Disability Liaison Officers (DLOs) visit all Victorian campuses on a regular basis.

Website: <http://www.monash.edu/equity-diversity/disability/index.html> Telephone: 03 9905 5704 to book an appointment with a DLO; or contact the Student Advisor, Student Community Services at 03 55146018 at Sunway Email: [dlu@monash.edu](mailto:dlu@monash.edu) Drop In: Equity and Diversity Centre, Level 1, Building 55, Clayton Campus, or Student Community Services Department, Level 2, Building 2, Monash University, Sunway Campus

## Your feedback to Us

Monash is committed to excellence in education and regularly seeks feedback from students, employers and staff. One of the key formal ways students have to provide feedback is through the Student Evaluation of Teaching and Units (SETU) survey. The University's student evaluation policy requires that every unit is evaluated each year. Students are strongly encouraged to complete the surveys. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied and areas for improvement.

For more information on Monash's educational strategy, see:

[www.monash.edu.au/about/monash-directions](http://www.monash.edu.au/about/monash-directions) and on student evaluations, see:  
[www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html](http://www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html)

## Previous Student Evaluations of this Unit

A Monquest evaluation will be run for this unit.

If you wish to view how previous students rated this unit, please go to <https://emuapps.monash.edu.au/unitevaluations/index.jsp>