

# CS324-15 Computer Graphics

**22/23**

**Department**

Computer Science

**Level**

Undergraduate Level 3

**Module leader**

Shan Raza

**Credit value**

15

**Module duration**

10 weeks

**Assessment**

Multiple

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

This course is a solid introduction to computer graphics, from how we see, display devices, and how computer graphics are generated by modern graphics processing units (GPUs).

With plenty of visual examples and demos, the lectures covers, step-by-step:

the graphic generation process and viewing geometry  
three-dimensional objects,  
parametric representations such as spline curves and surfaces,  
display lists and drawing primitives  
rasterisation onto a two-dimensional frame-buffer

On the way, we look at how realism is achieved by the clever use of texture-mapping and the approximation of lighting and shading, including shadow generation. We also look at ray-casting techniques, global illumination and volume rendering.

The course will assume you have some background in vector and linear algebra.

### Module aims

Graphical presentation of models of the physical world is an important aspect of current and future applications of computers. Students are introduced to the basic concepts of manipulating and modelling objects in 2D, 3D and 4D.

Techniques are introduced for realistically visualising models of objects in ways that exploit our visual senses.

## **Outline syllabus**

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Topics covered include:

- Graphics hardware
- Rendering processes
- Computational geometry of 2 and 3 dimensions
- Modelling and projection of 3 dimensional structures
- Spatial data structures
- Colour and texture
- Ray tracing
- 'Fractal' processes in graphics
- Demonstrations of graphics features will be given during the module.

## **Learning outcomes**

By the end of the module, students should be able to:

- At the end of this module, a successful student will: - Understand the mathematics behind geometric transformations and techniques for modelling objects; .
- - Understand the techniques used to approximate the physical process of image generation.
- - Have an understanding of how these techniques are made available through graphical programming standards.

## **Indicative reading list**

Please see Talis Aspire link for most up to date list.

[View reading list on Talis Aspire](#)

## **Subject specific skills**

Understanding of human perception and digital display devices.

Knowledge of terminologies and concepts of basic algorithms behind graphics kernels for drawing 2D, 3D primitives, transformations, clipping, modeling and rendering.

Expertise in designing, modelling and manipulating graphics objects using OpenGL.

## **Transferable skills**

Students will learn about displaying graphics objects and interaction on digital display devices.

Computer graphics is multidisciplinary subject. The students will study skills for developing graphics user interfaces, engineering designs, data visualization, photo realism, computer generated imagery (CGI).

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## Study

### Study time

Type	Required
Lectures	30 sessions of 1 hour (20%)
Practical classes	8 sessions of 1 hour (5%)
Private study	112 hours (75%)
Total	150 hours

### Private study description

- Matrix algebra, vectors, linear transformations and rules of differentiation.
- In addition to reading list for the module, additional reading materials suggested during class lectures. These materials will be uploaded to online materials for the module.
- Lecture slides will be available online as the module progress.

### Costs

No further costs have been identified for this module.

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## Assessment

You do not need to pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

### Assessment group D1

	Weighting	Study time
Unsupervised practical assignments	20%	
In-person Examination	80%	
CS324 Exam		

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- Answerbook Pink (12 page)
- Students may use a calculator

### Assessment group R

**Weighting****Study time**

In-person Examination - Resit  
CS324 Resit Exam

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100%

- Answerbook Pink (12 page)
- Students may use a calculator

**Feedback on assessment**

Written feedback on coursework.

[Past exam papers for CS324](#)

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**Availability****Courses**

This module is Optional for:

- UCSA-G4G1 Undergraduate Discrete Mathematics
  - Year 3 of G4G1 Discrete Mathematics
  - Year 3 of G4G1 Discrete Mathematics
- Year 3 of UCSA-G4G3 Undergraduate Discrete Mathematics
- Year 4 of UCSA-G4G4 Undergraduate Discrete Mathematics (with Intercalated Year)
- Year 4 of UCSA-G4G2 Undergraduate Discrete Mathematics with Intercalated Year
- Year 4 of UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)

This module is Option list A for:

- Year 4 of UCSA-G504 MEng Computer Science (with intercalated year)
- UCSA-G500 Undergraduate Computer Science
  - Year 3 of G500 Computer Science
  - Year 3 of G500 Computer Science
- UCSA-G502 Undergraduate Computer Science (with Intercalated Year)
  - Year 4 of G502 Computer Science with Intercalated Year
  - Year 4 of G502 Computer Science with Intercalated Year
- UCSA-G503 Undergraduate Computer Science MEng
  - Year 3 of G500 Computer Science
  - Year 3 of G503 Computer Science MEng
  - Year 3 of G503 Computer Science MEng
- Year 3 of UCSA-G406 Undergraduate Computer Systems Engineering
- Year 3 of UCSA-G408 Undergraduate Computer Systems Engineering
- Year 4 of UCSA-G407 Undergraduate Computer Systems Engineering (with Intercalated

Year)

- Year 4 of UCSA-G409 Undergraduate Computer Systems Engineering (with Intercalated Year)

This module is Option list B for:

- UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
  - Year 4 of G105 Mathematics (MMath) with Intercalated Year
  - Year 5 of G105 Mathematics (MMath) with Intercalated Year
- UMAA-G100 Undergraduate Mathematics (BSc)
  - Year 3 of G100 Mathematics
  - Year 3 of G100 Mathematics
  - Year 3 of G100 Mathematics
- UMAA-G103 Undergraduate Mathematics (MMath)
  - Year 3 of G100 Mathematics
  - Year 3 of G103 Mathematics (MMath)
  - Year 3 of G103 Mathematics (MMath)
  - Year 4 of G103 Mathematics (MMath)
  - Year 4 of G103 Mathematics (MMath)
- UMAA-G106 Undergraduate Mathematics (MMath) with Study in Europe
  - Year 3 of G106 Mathematics (MMath) with Study in Europe
  - Year 4 of G106 Mathematics (MMath) with Study in Europe
- Year 4 of UMAA-G101 Undergraduate Mathematics with Intercalated Year

This module is Option list C for:

- USTA-G302 Undergraduate Data Science
  - Year 3 of G302 Data Science
  - Year 3 of G302 Data Science
- Year 3 of USTA-G304 Undergraduate Data Science (MSci)
- Year 4 of USTA-G303 Undergraduate Data Science (with Intercalated Year)