

Module Details	
Module Title	Numerical Methods and Computer Graphics
Module Code	COS6021-B
Academic Year	2024/5
Credits	20
School	School of Computer Science, AI and Electronics
FHEQ Level	FHEQ Level 6

Contact Hours	
Type	Hours
Lectures	12
Laboratories	24
Directed Study	164

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Semester 1

Module Aims
<p>Computer graphics is a core technology in today's digital industry with many applications including e.g., virtual reality, simulation and animation, video games, data visualisation, healthcare information display, computer aided design. It has been one of the driving forces for the rapid development of computer hardware and software.</p> <p>This module will introduce, analyse and apply the basic principles, concepts, techniques and tools that are used to develop numerical algorithms for computer graphics, computer games and general real time application and instil an appreciation of the numerical techniques available for computer graphics, computer games, and general real time applications.</p>

## Outline Syllabus

### Key topics:

- \* Bazier Curve
  - \* Interpolation
  - \* Raster graphics algorithms
  - \* Geometric transformation and projection
  - \* Rotation and translation in 2-dimensional space
  - \* Rotation and translation in 3-dimensional space
- advanced rendering

All topics will require critical thinking, problem solving, analysis, and creativity in the process of developing numerical methods and creating computer graphics.

## Learning Outcomes

Outcome Number	Description
01	Demonstrate a breadth of knowledge of the problems encountered in real time implementation of numerical algorithms, and in the use of computer libraries to develop and implement efficient numerical algorithms for computer graphics, computer games, and general real-time applications.
02	Analyse and then implement real time solutions to problems in computer graphics, computer games and general real time applications, and use state-of-the-art computer libraries to develop and implement efficient numerical algorithms for computer graphics, computer games and general real-time applications.
03	Learn and work independently with patience and persistence using good general skills of organisation and time-management, be adaptable with a highly developed ability to assess problems from new areas logically through an analytical approach, write coherently and clearly communicate results.

## Learning, Teaching and Assessment Strategy

Utilising current research and case studies on the topic of Numerical Methods and Computer Graphics using OpenGL as the API, the students will participate in formal learning opportunities such as lectures, experiential learning through lab sessions, and informal and social learning through lab-based work, as well as independent study to explore concepts and solve real-world problems. The teaching and learning methods have been selected to engage students in developing their knowledge and understanding of Numerical Methods and Computer Graphics.

To support accessibility, clarity and comprehension all teaching material is provided online in advance of the teaching sessions. Throughout the programme, lots of opportunities are provided for students to design their own solutions and to express their own ideas, choosing from a variety of tools and methodologies. An emphasis is also placed on the importance of planning and goal setting, allowing students to forge a learning pathway that is suitable for their needs, while respecting the requirements of programme, and the needs of others, when working within a team.

The University recognises the importance of providing pastoral support, taking into consideration all aspects of our students' journeys and development. All students are allocated a personal academic tutor, with whom they meet regularly to discuss and receive guidance on their learning and development.

Throughout the module, students will be set tailor made programming activities that will help develop confidence in Numerical Methods and in the use of Computer Graphics design environment. These will be discussed, and assistance with their solution is provided in laboratory sessions, either on one-to-one basis or as a member of staff or student led group, as appropriate. The timely constructive feedback from this formative assessment will support students develop the skills and knowledge required for the summative assessment.

The module will be summatively assessed through a Coursework (Artefact), assessed during the module, to help evaluate and solidify students' understanding of learning to date. This will be followed by a 2-hour closed-book exam.

### Mode of Assessment

Type	Method	Description	Weighting
Summative	Coursework - Written	Create 2D and 3D Graphics using OpenGL	40%
Summative	Examination - Closed Book	Exam ? Closed book	60%

### Reading List

To access the reading list for this module, please visit <https://bradford.rl.talis.com/index.html>

#### *Please note:*

*This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.*