

MEng, BSc COMPUTER SCIENCE WITH HIGH-PERFORMANCE GRAPHICS AND GAMES ENGINEERING

THE MULTIBILLION-POUND GAMES INDUSTRY NEEDS YOU!

The gaming industry is experiencing a severe global skills shortage at a time when the growing VR and AR industries are increasing their graphical requirements. It needs highly skilled people to drive the next generation of entertainment.

By studying this course you'll be well placed to join one of the most performance-driven applications of computer science – the multi-billion dollar global games industry.

- Focus your career at the top-end of the games and related industries.
- Generate new levels of visual realism and effects on cutting-edge hardware platforms.
- Write the rendering engines that will power the next generation of games.



**THERE'S A GLOBAL SHORTAGE
OF HIGHLY SKILLED GRADUATES
IN THIS FIELD SO ONCE YOU'VE
COMPLETED THIS COURSE,
YOU'RE GOING TO BE IN DEMAND.**

**UK GAMES INDUSTRY MARKET IS ESTIMATED
TO BE WORTH MORE THAN £4.2 BILLION**



WHERE WILL IT TAKE YOU?

After completing this course, you will be equipped to enter the employment market in the games development, animation and visual production industries in roles such as:

- **technology leader for graphics and rendering**
- **games development team leader**
- **technical director**
- **games software developer.**

“I expect that students on these new programmes will graduate with exemplary expertise in graphics technologies, ready to step into key positions in the gaming and related industries.”

Paul Porter, COO and founder of Sumo Digital

“This new programme at the University of Leeds is a great initiative, which will produce the skilled technical developers the industry greatly needs.”

Mike Gamble, EU Territory Manager at Epic Games

The structure and content of the programmes have been steered by a mix of industry giants, large studios and low-level technical experts, including:

- **Barog**
- **Team17**
- **Double 11**
- **Sumo Digital**
- **Epic Games**
- **Weaseltron.**
- **NVIDIA**

Outside the games industry, the programming skills you develop during this course will allow you to secure a position in other performance-driven industries, for example embedded systems.

Your computer graphics expertise could also lead you to opportunities in the animation and visual production industries.

WHAT YOU'LL LEARN: OVERVIEW

By the end of this course, you will have the technical skills demanded by the industry in the following areas:

- low-level programming (C++, graphic and compute shaders)
- multi-core and many-core programming techniques
- computer graphics, from core principles to the practical techniques used in games, including:
 - geometric models
 - animation and simulation
 - advanced methods for visual realism
- game engine development techniques.

47%

of companies in the games sector
are experiencing a skills shortage

WHAT WILL YOU STUDY

This is a four-year degree but you do have the option of graduating after three years with a BSc in Computer Science. For the first three years you will study computer science modules and in your fourth year, you will specialise in High-Performance Graphics and Games Engineering with the following set of modules:

PARALLEL AND CONCURRENT PROGRAMMING

Introduces the principles, language constructs, data abstractions and programming techniques used to program with multiple execution threads on shared-memory architectures. It develops the skills needed to design, program, test, debug and tune non-trivial applications using industry-standard tools (C++ and CUDA). Advanced techniques covered include lock-free algorithms, use of specialised memory regions, and coalesced access for maximising parallel performance.

FOUNDATIONS OF MODELLING AND RENDERING

Builds a solid foundation of understanding for the physics, mathematics and computation underlying all computer graphics. Delving deeper than a first undergraduate module in 3D graphics, it delivers understanding of high-quality rendering through software raytracing as the essential foundation for building hardware-accelerated approximation of high-quality visual effects. This will be complemented by solid coverage of the mathematics necessary for full comprehension and exploitation of accelerated graphics hardware.

GAMES ENGINES AND WORKFLOW

Introduces the architecture and implementation of games engines, management of game assets and the workflow of games development, with a focus on the implementation strategies necessary for securing the high performance needed in modern games. A feature of the module is the use of a 'live' game engine as an ongoing case study laboratory for undertaking practical exercises.

GEOMETRIC PROCESSING

Focuses on geometric techniques for asset modelling, representation manipulation and management. Topics covered include mesh editing and simplification, volumetric modelling, geometric calculations, models of natural phenomena,

acceleration structures, computational geometry, point- and image-based rendering, and texture synthesis.

HIGH-PERFORMANCE GRAPHICS

Explores the concepts, algorithms and methods by which visually rich scenes are rendered under real-time constraints by exploiting the features of modern graphics hardware and software systems. It develops the skills needed to produce computationally efficient but approximate representations of complex visual phenomena by making informed trade-offs between physical realism, perception and computational cost of execution on graphics/games hardware.

COMPUTER ANIMATION AND SIMULATION

Covers motion in virtual environments, including animation, simulation and specialised rendering effects. Topics covered include: principles of interpolation, kinematics, motion blending and retargeting, and modelling clothing, fur and hair.

RESEARCH-BASED DEGREES

We have an active research environment which feeds directly into the development of this course. You'll be directly engaged in research through substantial individual and team-based project work, giving you access to our specialist facilities such as:

- workstations with high-end GPUs to act as DirectX12 and Vulkan games development platforms
- specialist hardware including the latest virtual reality headsets
- Epic's Unreal Engine 4 for learning games engine design and exploring new rendering.

1,902

video games companies
IN THE UK

AND THIS NUMBER IS GROWING BY 22% A YEAR





BE PART OF THE UK'S FASTEST GROWING INDUSTRY SECTOR

ENTRY REQUIREMENTS

Our standard entry requirements for September 2017 are:

- A-level: AAA including Mathematics or Computing, excluding General Studies
- BTEC Extended Diploma: D*DD including a D in Further Mathematics
- IB: 35 points overall, with 18 points at higher level to include 5 points in higher level Mathematics.

We welcome students with a range of qualifications so please check our website for more details. All applicants will need to have GCSE English Language at grade C or above, or an appropriate English language qualification.

GET IN TOUCH

t: +44 (0)113 343 5440

e: pgcomp@leeds.ac.uk



SCHOLARSHIPS AVAILABLE

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engineering.leeds.ac.uk/graphics



Grand Theft Auto

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UNIVERSITY OF LEEDS

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