MODULE SPECIFICATION TEMPLATE

**SECTION 1: MODULE SPECIFICATIONS**

1. Title of the module: **CO653** **Graphics Programming with C++**
2. School which will be responsible for management of the module: **School of Computing**
3. Start date of the module: **2014/2015**
4. The number of students expected to take the module: **40**
5. Modules to be withdrawn on the introduction of this proposed module and consultation with other relevant Schools and Faculties regarding the withdrawal: **CO652**
6. Level of the module*:* **H**
7. The number of credits and the ECTS value which the module represents: **15 (7.5 ECTS)**
8. Which term(s) the module is to be taught in (or other teaching pattern): **Autumn**
9. Prerequisite modules:

**CO325 Foundations of Computing II**

**CO510 Software Engineering**

**CO518 Algorithms, Correctness and Efficiency**

**CO520 Further Object-Oriented Programming**

1. The programme(s) of study to which the module contributes:

**Optional on Computer Science and related programmes (3 and 4 year variants)**

1. The intended subject specific learning outcomes.

**After successfully completing the module, a student will:**

**a) have experience with, and an understanding to an advanced level of, programming in an object-oriented language with low-level programming capabilities**

**b) be able to design and implement object-oriented solutions to a wide range of programming problems, using standard and third-party libraries where appropriate.**

**c) have an understanding of the differences between object-oriented languages and the features they provide.**

**d) be able to understand and modify existing complex object-oriented applications.**

**e) Have an understanding of the underlying geometry of 2D and 3D graphics**

**f) Have an appreciation of the programmable pipeline and shaders.**

**g) Have the ability to program both 2D and 3D graphics.**

1. The intended generic learning outcomes :

**On successful completion of this module, students will:**

**h) Be able to analyse a problem specification and to design and implement a solution.**

**i) Be able to evaluate systems in terms of function and performance, with an awareness of possible trade-offs.**

**j) Be able to communicate technical issues clearly to specialist audiences.**

**k) Be able to make effective use of IT facilities**

**l) Be able to manage their own learning and time.**

1. A synopsis of the curriculum

**Introduction to the C++ language, relating to students' previous knowledge of Java, including classes, inheritance, overloading and generic programming;**

**Review of the program build process, including preprocessing, compilation, linkage and libraries;**

**C++ specific items, including templates, pointers, freestore management including the use of smart pointers, inheritance including multiple inheritance and exception handling;**

**Low-level programming in C++, with particular reference to issues important in games programming;**

**High-level programming in C++, covering large scale applications, efficient programming (particularly in relation to games) and design patterns;**

**Coverage of standard libraries, where to look for these, and how to use them; Programming Games 2D and 3D Graphics Engines via a common API.**

**The 3D Graphics pipeline, including shaders and efficient GPU programming.**

**Generating 2D images and 3D graphics. Matrix manipulation including translation, scaling and rotation, as well as examining the ModelViewProjection matrix.**

1. Indicative Reading List
* **B. Stroustrup, "The C++ Programming Language", 4th edition, Addison-Wesley, 2013. ISBN: 978-0-321-56384-2.**
* **Bruce Eckel, "Thinking in C++", Vols 1 and 2, 2nd edition, Prentice Hall, 2000. Available free online.**
* **Mike Dickheiser, "C++ for Game Programmers" 2nd edition, Charles River Media, 2006. ISBN: 978-1584504528.**
* **F. Kerger, "Ogre 3D Beginner's Guide", Packt Publishing, 2010. ISBN 978-1-849512-48-0.**
* **OpenGL Programming Guide: The Official Guide to Learning OpenGL by Dave Shreiner and The Khronos OpenGL ARB Working Group. ISBN 978-0321773036.**
1. Learning and Teaching Methods, including the nature and number of contact hours and the total study hours which will be expected of students, and how these relate to achievement of the intended learning outcomes

**150 Hours total**

**22 Hours of lectures [b, c, d, e, f, g, h, i]**

**6 Hours of terminal sessions [a, b, d, g, h, j, k]**

**60 Hours assessment [a, b, d, e, g, h, j, k, l]**

**62 Hours self-directed learning [b, c, d, e, f,, k, l]**

**Whilst many learning outcomes can be covered in lectures and self-directed learning, the module has an emphasis on developing technological solutions that demonstrate that the student understands the material. So to enable students to make a good start on C++ development and games programming, practical classes are called for. The practical classes, assessment and part of the self-directed learning will be largely focussed on achieving the technical learning outcomes.**

1. Assessment methods and how these relate to testing achievement of the intended learning outcomes

**50% Unseen final written examination [c, d, e, f, i, j].**

**50% Coursework: Assessments to test a student’s ability to implement C++ and Graphics [a, b, c, e, f, g, h, i, j, k].**

1. Implications for learning resources, including staff, library, IT and space

**None beyond that already provided.**

1. **The School recognises and has embedded the expectations of current disability equality legislation, and supports students with a declared disability or special educational need in its teaching. Within this module we will make reasonable adjustments wherever necessary, including additional or substitute materials, teaching modes or assessment methods for students who have declared and discussed their learning support needs. Arrangements for students with declared disabilities will be made on an individual basis, in consultation with the University’s disability/dyslexia support service, and specialist support will be provided where needed.**

**The subject matter makes this module unsuitable for students with severe visual impairments. Students with certain minor visual impairments, such as colour blindness, should consult the convenor before selecting this module**

1. Campus(es) where module will be delivered[[1]](#footnote-1)

**Canterbury**

***If the module is part of a programme in a Partner College or Validated Institution, please complete the following:***

1. Partner College/Validated Institution
2. University School (for cognate programmes) or Faculty (for non-cognate programmes) responsible for the programme

**SECTION 2: MODULE IS PART OF A PROGRAMME OF STUDY IN A UNIVERSITY SCHOOL**

**Statement by the School Director of Learning and Teaching/School Director of Graduate Studies (as appropriate):** "I confirm I have been consulted on the above module proposal and have given advice on the correct procedures and required content of module proposals"

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| ................................................................Director of Learning and Teaching/Director of Graduate Studies (delete as applicable)…………………………………………………Print Name | ..............................................Date |

**Statement by the Head of School:** "I confirm that the School has approved the introduction of the module and, where the module is proposed by School staff, will be responsible for its resourcing"

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| .................................................................Head of School…………………………………………………….Print Name | ..............................................Date |

**SECTION 3: MODULE IS PART OF A PROGRAMME IN A PARTNER COLLEGE OR VALIDATED INSTITUTION**

(Where the module is proposed by a Partner College/Validated Institution)

**Statement by the Nominated Officer of the College/Validated Institution** *(delete as applicable)***:** "I confirm that the College/Validated Institution*(delete as applicable)* has approved the introduction of the module and will be responsible for its resourcing"

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| .................................................................Nominated Responsible Officer of Partner College/Validated Institution ………………………………………………….Print Name………………………………………………….. Post | ..............................................Date |

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Partner College/Validated Institution

5 February 2014

1. Required for information purposes only. Changes of campus will not require re-approval of the module specification. [↑](#footnote-ref-1)