### Course Title: Serious Game Design & Implementation

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<tr>
<th>Course Code:</th>
<th>HECOS Code:</th>
<th>Academic Session:</th>
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<tr>
<td>PSGV104</td>
<td></td>
<td>2021-22</td>
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#### 2. Date of Approval: 3. Lead School: 4. Other Schools:
PACAAG April 2020  School of Simulation & Visualisation  N/A

#### 5. Credits: 6. SCQF Level: 7. Course Leader:
40  11  Dr Sandy Louchart

#### 8. Associated Programmes:
- MSc Serious Games and Virtual Reality

#### 9. When Taught:
Semester 1

#### 10. Course Aims:
- Introduce and review recent applications of serious games in a wide range of disciplines
- Introduce students to fundamental principles of serious games design in heritage or medical visualization.
- Encourage students to critically evaluate their practice in relation to recent applications within the fields of enquiry;
- Introduce students to fundamental principles of design and development of interactive 3D visualisation/simulation systems using state-of-the-art input devices and display technology.
- Provide students with a comprehensive exploration of the relevant theoretical and practical issues involved in three-dimensional modelling and animation.
- Prepare the student for employment in the game, training and education industries
- Enable students to understand a 3D graphics API, the processes of computer graphics programming, storage, ad visualisation of graphics/images on various display devices;
- Develop communication and practical skills with particular reference to 3D graphics programming;
- Design and implement programming structures as well as algorithms in the area of 3D graphics and visualisation

#### 11. Intended Learning Outcomes of Course:
On successful completion of the course the student will be able to:
1. Demonstrate a critical understanding and knowledge of history and recent development of serious games development and research;
2. Design serious games for specified application domains
3. Critically review, consolidate and extend knowledge, skills, and practices in the subject of 3D Visualisation.
4. Demonstrate a critical understanding and knowledge of 3D concepts and contemporary modelling and animation techniques, and its relation to medical or heritage visualisation and the creation of serious games;
5. Design and create a computer generated 3D model, demonstrating the principal techniques of 3D modelling and animation;
6. Demonstrate a critical understanding of fundamental game development concepts.
7. Select and apply game development concepts and techniques in the design, implementation, and documentation of a game demo

12. Indicative Content:
This course will cover issues including
- Current practices in serious games research
- Serious games taxonomy
- Game-based learning and applications
- Critical analysis of Serious games and their mechanics (Game mechanics, learning mechanics, serious games mechanics)
- Game design, game study, game theories
- Evaluation and assessment of serious games
- Gamification
- Virtual / Augmented reality gaming, virtual environments such as Second Life
- Background and history to medical or heritage visualisation
- 3D visualisation for education, training, and teaching in a specified field such as heritage or medical application design.
- Display technologies and methods (scale, 2D, 3D, immersive, remote, stereoscopic vision)
- 3D Coordinate systems
- Scene setup and good workflow practice
- Modelling methods (polygonal modelling, NURBS modelling, subdivision surfaces), pros and cons of each method, and its applications
- Texture mapping, materials and shading
- Reference gathering
- Lighting and shadows
- Cameras and Rendering
- Fundamentals of practical animation: keyframe animation
- Computer game platforms and technologies
- Interactive computer graphics fundamentals for 3D and 2D representations
- Techniques for input, animation, collision detection
- Implementing game states and object-oriented programming techniques in game development

13. Description of Summative Assessment Methods:
<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Description of Assessment Method</th>
<th>Weight %</th>
<th>Submission week (assignments)</th>
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<tbody>
<tr>
<td>Practical project</td>
<td>Serious Game Concept and prototype (board game)</td>
<td>35</td>
<td>Week 13</td>
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<tr>
<td>Coursework</td>
<td>Work in a small group to develop a 3D interactive simulation / visualisation (80%), and provide an individual reflective report (20%)</td>
<td>35</td>
<td>Week 13</td>
</tr>
<tr>
<td>Coursework</td>
<td>Production of a 3D modelling portfolio</td>
<td>30</td>
<td>Week 13</td>
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**13.1 Please describe the Summative Assessment arrangements:**

Coursework 1: Students will work in a group to develop a playable serious game (board game) related to the chosen area of CW1 with an appropriate project design journal – Game and design documentation and journal for 35% weight of the total course grade.

Coursework 2: A group project, 35% weight of the final course grade. Of this, 20% will be based on an individual report and reflection, taking individual contributions to the group project into account, the remaining 80% based on the practical project submission. Students will be assessed on their ability to:

- demonstrate a detailed and informed grasp of the recent development of applications serious games, visualisation and simulation;
- how an understanding of the practice and theory contexts in relation to which their project is positioned;
- design and develop a prototype of 3D serious game, visualisation or simulation system using state-of-the-art devices, display technologies, and professional tools;
- demonstrate an understanding of the detailed processes involved in design and implementation of visualisation and serious game systems;
- demonstrate ability to work in a multidisciplinary team and project management skill

Coursework 3: demonstrate a critical knowledge of 3D modelling and animation techniques and practice worth 30% of the total course grade;

- show an understanding of the practice and theory contexts in relation to which their project is positioned;
- exhibit appropriate level of skill demonstrated in each area of modelling and animation;
- demonstrate good command of verbal, written and visual outcomes to communicate and articulate ideas;
- demonstrate ability to structure tasks and overall workload

**14. Description of Formative Assessment Methods:**

Engagement with formative assessment is a mandatory requirement. Individual and group feedback is available during tutorials to provide formative assessment. Individual written work can be formatively reviewed by submission of draft text. Specific sessions are scheduled for this purpose at key stages of the course and include:

- Play test sessions
- Demo sessions
- Group presentation of early prototype for feedback

**14.1 Please describe the Formative Assessment arrangements:**
Individual feedback is available during tutorials to provide formative assessment. The wide range of coursework will provide the bulk of formative and summative assessment for the full range of 3D modelling and animation skills, serious game design and interactive visualisation.

15. Learning and Teaching Methods:

<table>
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<th>Formal Contact Hours</th>
<th>Notional Learning Hours</th>
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<td>80</td>
<td>400</td>
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15.1 Description of Teaching and Learning Methods:
Timetable: Timetable will be available in the induction week.
This course is taught across three distinct projects, with teaching based in the digital studios.
Learning and teaching is through a combination of lectures, in-class discussions and studio-based supported practical sessions, along with student self-directed study and practice.

16. Pre-requisites:
N/A

17. Can this course be taken by Exchange/Study Abroad students? Yes
18. Are all the students on the course taught wholly by distance learning? No
19. Does this course represent a work placement or a year of study abroad? No
20. Is this course collaborative with any other institutions? No
20.1 If yes, then please enter the names of the other teaching institutions: N/A

21. Additional Relevant Information:
This course is intended to provide students with an introduction to serious games design, 3D modelling and interactive visualisation techniques and approaches. In this course, students will acquire the principal skills and knowledge required to successfully design a serious game to a specified theme, create and animate 3D objects and develop a serious games application using commercial software /tools and programming/scripting.

22. Indicative Bibliography:
About game design in general
These are books about game design which are well written and cover the main aspects of a good game making and design. They are available to read online with the GSA library.


About Serious games
Background and state-of-the-art research on serious games
- Serious Games Development and Applications - International Conference, SGDA
About Serious Game Design
These are books specific about serious game design

Instructional Design (extracts will be provided to students for study in class)

About 3D Modelling
- Autodesk, 3DS Max Tutorials [http://docs.autodesk.com/3DSMAX/16/ENU/3ds-Max-Tutorials/](http://docs.autodesk.com/3DSMAX/16/ENU/3ds-Max-Tutorials/)

About Interactive Visualisation
- Unity Learning Website. (December 2016), [https://unity3d.com/learn](https://unity3d.com/learn)