

**Course Code:**

PMVS103

**Session:**

2017/18

**1. Course Title:**

Applications in Medical Visualisation

**2. Version**

1.1

**Date of Production**

Session 2015/16

**Approval Date**

16 September 2015 (PACAAG)

**3. Level:**

SCQF 11

**4. Credits:**

15

**5. Lead School/Board of Studies:**

School of Simulation and Visualisation

**6. Course Contact:**

Brian Loranger

**7. Course Aims:**

The course aims to:

- Introduce and review recent applications in medical visualisation and simulation;
- 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.

**8. 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 applications in medical visualisation
2. Demonstrate self-direction and ability to work with others to design and develop medical applications to deal with complex issues using various Virtual Reality devices and software
3. critically review, consolidate and extend knowledge, skills, and practices in the subject

**9. Indicative Content:**

This course will cover issues including

- Background and history to medical visualisation
- Medical visualisation for education & training, patient understanding of disease process and route to cure, physiotherapy and rehabilitation
- Visualisation techniques in surgical simulation, tele-operation (remote medicine, supportive diagnostic), remote operations using virtual reality and robotic surgery
- Virtual Reality, Augmented Reality, and user interfaces
- Display technologies and methods (scale, 2D, 3D, immersive, remote, stereoscopic vision)
- Motion tracking, haptics, and how these relate to medical visualisation and future applications
- Virtual endoscopy
- Medical rapid prototyping
- Complete pipeline from cadaveric selection to final visualisation and interaction, a case study: head and neck
- Macro and micro biological visualisation: techniques and visualisation methods

**10. Description of Summative Assessment:**

No.	Assessment Method	Description of Assessment Method	Weight %	Submission week (assignments) or length (exam)
1	Coursework	Work in a small group to develop a 3D interactive medical simulation/visualisation (80%), and provide an individual reflective report (20%)	50	Week 12 (indicative)
2	Essay	2000 word written essay	50	8 (indicative)

**10.1 Please describe the Summative Assessment arrangements:**

The learning outcome 1 will be assessed through a group project, 20% of which will be based on an individual report and reflection, taking individual contributions to the group project into account  
Students on this course will be assessed on their ability to:

- demonstrate a detailed and informed grasp of the recent development of applications in medical visualisation and simulation;
- show an understanding of the practice and theory contexts in relation to which their project is positioned;
- design and develop a prototype of 3D medical 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 medical visualisation systems;
- demonstrate ability to work in a multidisciplinary team and project management skill

The learning outcome 2 will be assessed through a 2000-word written essay (this could include examples of visual work, where appropriate, and a bibliography) in the areas of medical visualisation.

**11. Formative Assessment:**

Individual feedback is available during tutorials to provide formative assessment.  
Group presentation of early prototype for feedback (around week 6)

**11.1 Please describe the Formative Assessment arrangements:**

**12. Collaborative:**

Yes

No

**12.1 Teaching Institutions:**

The University of Glasgow

**13. Requirements of Entry:**

None

**14. Co-requisites:**

None

**15. Associated Programmes:**

MSc Medical Visualisation and Human Anatomy

**16. When Taught:**

Stage 1

**17. Timetable:**

Timetable will be available in the induction week.

**18. Available to Visiting Students:**

Yes

No

**19. Distance Learning:**

Yes

No

**20. Placement:**

Yes

No

<b>21. Learning and Teaching Methods:</b>		
<b>Method</b>	<b>Formal Contact Hours</b>	<b>Notional Learning Hours (Including formal contact hours)</b>
Lecture	10	
Studio		
Seminar/Presentation		
Tutorial	20	80
Workshop		
Laboratory work		
Project work		
Professional Practice		
E-Learning / Distance Learning		
Placement		
Examination		
Essay		20
Private Study	Not Applicable	
Other (please specify below)		
<b>TOTAL</b>	<b>30</b>	<b>150</b>

<b>22. Description of "Other" Teaching and Learning Methods:</b>

<b>23. Additional Relevant Information:</b>
<p>This course introduces and reviews a large variety of applications of medical models in 3D visualisation of specific anatomy, diagnosis and communication of complex pathologies, pre-operative planning of surgical interventions, custom-made implant design, production of customised medical devices, surgical templates, teaching aids, etc. The course is designed to provide students with the programming/scripting techniques necessary to develop medical applications using commercial software and tools.</p>

<b>24. Indicative Bibliography:</b>
<p><b>BOOKS</b></p> <p>Feng Dong, Gheorghita Ghinea, Sherry Y. Chen (2008) <i>User centered design for medical visualisation</i>, Medical Information Science Reference. ISBN 9781599047799</p> <p><b>JOURNALS</b></p> <p>Presence: Teleoperators and Virtual Environments, MIT Press  Virtual Reality, Springer Verlag  The Virtual Reality Society Journal, Springer Verlag  IEEE Computer Graphics and Applications  IEEE Transactions on Information Technology in Biomedicine  Artificial Intelligence in Medicine  Studies in Health Technology and Informatics, IOS Press</p>

## CONFERENCES

Medicine meets Virtual Reality

IEEE Virtual Reality conference

SIGGRAPH - ACM conference on computer graphics and interactive techniques

Eurographics - Conference of the European Association for Computer Graphics

Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems

IEEE Symposium on 3D User Interface

EuroHaptics - European conference on haptic sensing and touch enabled computer applications

Conference on Computer Assisted Radiology and Surgery

IEEE and ACM International Symposium on Mixed and Augmented Reality

Conference on Medical Image Computing and Computer Assisted Interventions

## WEBSITES

Unity Learning Website. (December 2016), <https://unity3d.com/learn>

Unity Documentation. (December 2016), <https://docs.unity3d.com/Manual/index.html>

Unity Non-Gaming Showcase. (December 2016), <https://unity3d.com/showcase/gallery/non-games>