

Course Code:

TBC

1. Course Title:

Applications in Medical Visualisation

2. Academic Session:

2011/12

3. Level:

SCQF 11

4. Credits:

15

5. Lead School/Board of Studies:

Digital Design Studio

6. Course Contact:

Dr. Minhua Eunice Ma

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. design and develop medical applications to deal with complex issues using various Virtual Reality devices and software;
3. demonstrate self-direction through the development and management of a project of research.

4. 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
- Physical device simulators
- Medical visualisation for radiotherapy training, virtual prototyping in medicine, medical visualisation from a patient perspective—learning, understanding of disease process, route to cure
- Macro and micro biological visualisation: techniques and visualisation methods
- Physiotherapy, diagnosis of sports injuries, body mapping, structure and mechanics, Virtually Better inc. post traumatic stress disorder/ therapeutic support using advanced visualisation techniques
- Visualisation techniques in GP's surgery, applications of Tele-operation (remote medicine/supportive diagnostic), remote operations using virtual reality and robotics
- Virtual Reality & user interfaces
- Display technologies and methods (scale, 2D, 3D, immersive, remote)
- Body tracking, image capture, haptics
- DDS Lab1 technology (stereo vision, haptics, motion tracking and how these relate to medical visualization and future applications, sound as a navigation and guiding tool, laser scan data and techniques of cadaveric dissection)
- Picture archiving and communication systems
- Security of patient data, and PACS
- Post process data and model a specific anatomical region or organ, ZBrush demonstrated as a technique for med vis. e.g. facial reconstruction
- Forensics reconstruction
- A case study: head and neck
- Complete pipeline from cadaveric selection to final visualisation and interaction

10. Description of Summative Assessment:

For this course, students will be assessed through a written examination and a coursework.

Examination weighting: 60%

The learning outcome 1 will be assessed through a close-book written examination.

Coursework weighting: 40%

The learning outcomes 2-4 will be assessed through a group project to demonstrate competency in design and development of interactive 3D visualisation/ simulation systems using state-of-the-art devices and display technologies and apply knowledge and understanding of key visualisation techniques.

10.1 Please describe the Summative Assessment arrangements:

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.

11. Formative Assessment:

N/A

11.1 Please describe the Formative Assessment arrangements:

N/A

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

21. Learning and Teaching Methods:		
Method	Formal Contact Hours	Notional Learning Hours (Including formal contact hours)
Lecture	10	50
Studio		
Seminar/Presentation		
Tutorial	18	90
Workshop		
Laboratory work		
Project work		
Professional Practice		
E-Learning / Distance Learning		
Placement		
Examination	2	10
Essay		
Private Study	Not Applicable	
Other (please specify below)		
TOTAL	30	150

22. Description of "Other" Teaching and Learning Methods:

N/A

23. Additional Relevant Information:

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.

24. Indicative Bibliography:

BOOKS

Feng Dong, Gheorghita Ghinea, Sherry Y. Chen (2008) *User centered design for medical visualisation*, Medical Information Science Reference. ISBN 9781599047799

Elena Zudilova-Seinstra, Tony Adriaansen, Robert Van Lierre (Eds.) (2009) *Trends in interactive visualization: state-of-the-art survey*, Springer Verlag. ISBN 9781848002692

Berhard Preim, Dirk Bartz (2007) *Visualisation in medicine: theory, algorithms, and applications*, Morgan Kaufmann Publishers Inc. ISBN 9780080549057

JOURNALS

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

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