Programme Specification
Postgraduate Programmes

Goldsmiths
UNIVERSITY OF LONDON

Awarding Body/Institution	University of London
Teaching Institution	Goldsmiths, University of London
Name of Final Award and Programme Title	MA Virtual and Augmented Reality (3D Graphics and User Experience Pathway) MSc Virtual and Augmented Reality (Programming and Computer Science Pathway)
Name of Interim Award(s)	Postgraduate Certificate in Virtual Reality (3D Graphics and User Experience Pathway) Postgraduate Diploma in Virtual Reality (3D Graphics and User Experience Pathway) Postgraduate Certificate in Virtual and Augmented Reality (Programming and Computer Science Pathway) Postgraduate Diploma in Virtual and Augmented Reality (Programming and Computer Science Pathway)
Duration of Study/Period of Registration	1 year FT or 2-3 years PT
UCAS Code(s)	N/A
HECoS Code(s)	(100363) Computer Animation and Visual Effects
QAA Benchmark Group	Computing
FHEQ Level of Award	Level 7
Programme Accredited by	N/A
Date Programme Specification last updated/approved	August 2019
Primary Department/Institute	Computing

Departments which will also be involved in teaching part of the programme
Not Applicable

Programme overview

Immersive experiences, including Virtual and Augmented Reality are the most exciting new medium to emerge in the 21st century. Virtual Reality (VR) is a medium unlike any other, it completely immerses you in a new world that can feel as real as the physical world around you. No other medium can create an experience like it, and most people who have tried it will know that it is the medium of the future.

Augmented Reality (AR) integrates these kind of immersive 3D environments with the real world allowing our real world interactions to be enhanced with digital content. Together VR and AR are parts of a continuum of experience, Mixed Reality (or MR), that combines real and virtual in many different ways to create a huge range of immersive experiences, that are unlike anything that has been previously possible.

Virtual and Augmented Reality is a rapidly developing medium: the basic grammar has yet to be established and there are still very few experienced content creators. If you enter VR, AR and MR now, you have the opportunity to pioneer and shape a medium that is likely to have a major impact on the 21st Century.

While mass market VR and AR is a new medium, it builds on a long tradition of technology research. Content creators who don't know the results of this research are likely to make basic mistakes. Goldsmiths staff have decades of experience researching in VR/AR and know the technology well. They are also world experts in the psychology of the VR/AR experience. VR/AR is so different from other media because it creates the illusion of Presence, or being in another place. Understanding how that illusion works is vital to creating great VR/AR experiences.

This masters programme will give you a strong technical background in the skills needed for VR and AR development, with two strands, one focusing on 3D Graphics and User Experience Engineering and the other on programming. This will be combined with a deep understanding of the medium from an artistic and psychological point of view.

You will study topics such as presence, immersive user experience design, virtual characters, social VR, photogrammetry, 3D interaction, machine vision, mixed reality and augmented reality. You will have the opportunity to meet world class VR developers from London and beyond in our regular seminar series and get a start on your career in VR with our work placement programme.

Virtual and Augmented Reality is being used in games, film, medicine, journalism, advertising, education, engineering and many other industries. Your expertise in the medium will open up jobs in this area and many more. Our Industry advisory board helps us ensure that the content you learn will stay relevant to the needs of industry.

What you will study

The programme is delivered by two experts in Virtual and Augmented Reality research with experience going back to the 1990s, as well as industry professionals in 3D graphics art and programming. We aim to equip you with the skills to become a Virtual and Augmented Reality creator ready to help define this new medium. That means a good understanding of the technologies of Virtual and Augmented Reality and their psychological effects. You will apply this knowledge to develop VR, AR and MR experiences across a range of application areas such as games, arts, education, engineering, and healthcare. You will be encouraged to follow your own interests in VR within the domains you are passionate about.

This is a highly interdisciplinary programme combining technical skills with an understanding of the psychology of VR/AR and the creativity need to develop novel experiences. Goldsmiths has a long tradition of interdisciplinary work in computing, seeing it not simply as a technical discipline but a creative one. Virtual and augmented is one of the best examples of need for this interdisciplinary thinking. Having said that, the programme does provide two pathways depending on the skills that you will bring to the creation of VR and AR. The 3D Graphics and User Experience Pathway will focus on 3D graphics design and animation and the Programming and Computer Science pathway will focus on programming VR environments. Students on each pathway will have opportunities to also pick up skills from the other pathway if they want to work across disciplines.

The programme will culminate in a final project that will allow you to develop a complete, major VR or AR experience of your own. The programme has strong industry links and you will also have the opportunity to do your project as a placement in industry.

Programme entry requirements

A BA or BSc Degree at 2.2 level or above. For the 3D Graphics and User Experience pathway the degree should be in a subject related to visual art or design. For the Programming and Computer Science pathway the degree should be in a subject related to computer science or engineering. Students with a video games related undergraduate will also be well equipped for this programme. Outstanding

practitioners or individuals with strong commercial experience and/or a strong portfolio of graphics or programming work may be considered.

Non-native English students should normally have a minimum IELTS score of 6.5 or equivalent.

Aims of the programme
This programme aims to produce a new generation of VR creators who are able to take a lead in defining this new medium. Our graduate will be strongly interdisciplinary, bringing an understanding of the science and technology of VR to their innovative creative practice.

In particular graduates will have

- An interdisciplinary understanding of Virtual and Augmented Reality encompassing psychology, technology and creative practice
- Strong technical development skills that enable a personal VR and AR creation practice
- Strong transferable skills, in particular the ability to work independently and in groups and to reflectively evaluate their own work.

What you will be expected to achieve

Students who successfully complete either pathway in the Postgraduate Certificate in Virtual Reality will demonstrate:

Knowledge and Understanding		Taught by the following modules
A1	Apply knowledge of the current state in the art of Virtual Reality hardware and software technologies to selecting, implementing and critically evaluating appropriate technologies for a project	Introduction to Virtual Reality
A2	Apply knowledge of the psychological illusions and physiological effects of virtual reality and their causes to design and/or critically evaluate virtual reality experience	Introduction to Virtual Reality
A3	Apply knowledge of a number of technologies and development approaches that are relevant to Virtual Reality, within their original domain	Optional Modules
A4	Critically analyse the applicability of Virtual Reality to a range of domains	Introduction to Virtual Reality Optional Modules

Cognitive and Thinking Skills		Taught by the following modules
B1	Critically analyse virtual reality experiences in commercial, applied, and creative contexts.	Introduction to Virtual Reality

Subject Specific Skills and Professional Behaviours and Attitudes	Taught by the following modules

C1	Design and implement a simple virtual reality project	Introduction to Virtual Reality
C2	Use a range of technologies and development processes to implement simple projects within their original domain	Optional Modules

Transferable Skills		Taught by the following modules
D1	Communicate effectively, both in writing and in presentations to an audience	This will be taught throughout the programme
D2	Work effectively in groups.	This will be taught throughout the programme
D3	Take responsibility for, plan and execute independent project work	This will be taught throughout the programme

In addition to the generic PGCert learning outcomes, students who successfully complete the PGCert (3D Graphics and User Experience Pathway) will demonstrate:

Subject Specific Skills and Professional Behaviours and Attitudes		Taught by the following modules
C3	Design and create 3D graphics and animation assets to a basic professional level	Introduction to Modelling and Animation

In addition to the generic PGCert learning outcomes, students who successfully complete the PGCert (Programming Pathway) will demonstrate:

Subject Specific Skills and Professional Behaviours and Attitudes		Taught by the following modules
C4	Design and program software systems for 3D graphics to a basic professional level	Introduction to Programming for Games and Interactive Graphics Mathematics and Graphics for Computer Games 1

In addition to the learning outcomes for the PGCert, students who successfully complete the Postgraduate Diploma either pathway will demonstrate:

Knowledge and Understanding		Taught by the following modules
A5	Apply knowledge of the current state in the art of Mixed and Augmented Reality hardware and software technologies to select and implement appropriate technologies for a project	Mixed Realities

A6	Apply in-depth knowledge of a number of specific areas of current Virtual and Mixed Reality research and practice to the development of VR or MR project	Advanced Topics in Virtual and Augmented Reality

Cognitive and Thinking Skills		Taught by the following modules
B2	Critically evaluate current research and practice in virtual and mixed reality	Advanced Topics in Virtual and Augmented Reality Mixed Realities

Subject Specific Skills and Professional Behaviours and Attitudes		Taught by the following modules
C5	Replicate a piece of research in Virtual and Augmented Reality	Advanced Topics in Virtual and Augmented Reality
C6	Apply research results and contemporary approaches to practice in Virtual and Mixed Reality to the development of small projects	Advanced Topics in Virtual and Augmented Reality Mixed Realities

In addition to the learning outcomes above, students who successfully complete the MA or MSc Virtual and Augmented Reality will be able to:

Transferable Skills		Taught by the following modules
D4	Plan and execute a substantial project under expert supervision	Final Project in Virtual and Augmented Reality (either pathway)
D5	Manage their time and other resources within the context of a substantial independent project	Final Project in Virtual and Augmented Reality (either pathway)
D6	Present their own work in writing to the standard of published academic research	Final Project in Virtual and Augmented Reality (either pathway)

In addition to the generic MA/MSc learning outcomes, students who successfully complete the MSc (Programming and Computer Science Pathway) will demonstrate:

Cognitive and Thinking Skills		Taught by the following modules
B3	Apply knowledge of the state of the art in Virtual and/or Mixed Reality research and practice to the design, implementation and/or evaluation of a substantial Virtual or Mixed Reality computing system or theory, in the context of academic	Final Project in Virtual and Augmented Reality (Programming and Computer Science Pathway)

	research or industrial practice	

Subject Specific Skills and Professional Behaviours and Attitudes		Taught by the following modules
C7	Develop a substantial Virtual or Mixed Reality programming project to a professional standard	Final Project in Virtual and Augmented Reality (Programming and Computer Science Pathway)

In addition to the generic MA/MSc learning outcomes, students who successfully complete the MA (3D Graphics and User Experience Pathway) will demonstrate:

Cognitive and Thinking Skills		Taught by the following modules
B4	Apply knowledge of the state of the art in Virtual and/or Mixed Reality research and practice to the design and/or evaluation of a substantial Virtual or Mixed Reality experience or theory, in the the context of academic research or industrial practice	Final Project in Virtual and Augmented Reality (3D Graphics and User Experience Pathway)

Subject Specific Skills and Professional Behaviours and Attitudes		Taught by the following modules
C8	Develop a substantial Virtual or Mixed Reality 3D graphics and/or user experience project to a professional standard	Final Project in Virtual and Augmented Reality (3D Graphics and User Experience Pathway)

How you will learn

The Department of Computing is committed to a diverse and stimulating range of learning and teaching methods that ensure the programme outcomes are addressed rigorously and effectively. These may include traditional lectures but the focus will be on interactive and student centred methods. We will make extensive use of flipped classrooms, making use of material from our existing 22 week MOOC on Virtual Reality. Students will have video material from which to learn core material before and after classes and the classes themselves will focus on interactive discussion and practical work.

Much of the teaching will be in a hands-on lab environment with considerable opportunity for self directed work and peer-to-peer teaching. Students will also be required to actively engage with current research by present and replicating studies.

We will also experiment with the use of Virtual and Augmented Reality itself as a teaching medium. These sessions will be as much about the experience of VR in learning as the learning itself. Students will be encouraged to reflect on the use of VR in their studies to better understand it as an educational medium.

In addition, MA/MSc VAR students will attend a weekly external speaker programme with the MA/MSc Games and PhD Students. Previous speakers include senior people from Creative Assembly, Swrve,

Supermassive, Rebellion, Geomerics, Radiant Worlds and many more. Students have opportunity to meet the speakers over coffee after the talks and make useful contacts. Students will be encouraged to attend wider Goldsmiths lectures including the Whitehead Lectures and the Human Interactive Conference.

How you will be assessed

The Department is committed to providing diverse types of assessment. Our methods of assessment are designed to reflect research and commercial activities and to encourage independent creative thinking and working mixed with collaborative work. Students will be required to present their work in a number of different ways including demos with associate code / analytics data, reports and short management reports, oral presentations and software delivery.

Each module in the programme will have its own assignments, reflecting to the nature of the module. In addition to modular assignments, students will have a major final project in the summer term, which should build on what students have learnt throughout the programme. The final project is an opportunity for students to work independently on a large project at a research level or work externally on-site at a company on a placement (which includes delivery of a report).

In collaborative assignment work, particular care must be taken by students to describe clearly and precisely the nature of their contributions, and the contributions of their group collaborators. This must be delivered as part of students' assignment written reports and/or evaluation documentation, as required in the documentation brief.

Final projects will be assessed based on the submission of a final report and a presentation in a viva. Guidance on the structure and writing of the report will be given in the module handbook. Projects will be marked by a panel composed of two members of academic staff.

Marking criteria

Mark	Descriptor	Specific Marking Criteria
80-100%	Distinction (Outstanding/Exceptional)	Represents a demonstration of exceptional understanding, insight and achievement of the aspects described in the criteria for a distinction grade.
70-79%	Distinction	Demonstration of excellence in understanding based on a thorough grasp of relevant concepts, methodology and content; display of skill in applying and interpreting complex material; organization of material at a high level of competence. Students should be able to demonstrate the ability to work independently to research and implement and in some cases extend state-of-the- art technologies.
60-69%	Merit	Demonstration of a deep level of understanding based on a competent grasp of relevant concepts, methodology and content; display of skill in applying interpreting complex material; organization of material at a high level of competence. Students should be able to demonstrate the ability to work independently to research and implement state-of-the-art technologies.

50-59%	Pass	Demonstration of a sound level of understanding based on a competent grasp of relevant concepts, methodology and content; display of skill in organizing, discussing and applying complex material. Students should be able to implement state-of-the-art technologies under guidance.
30-49%	Fail	Represents an overall failure to achieve the appropriate learning outcomes. A mark at this level is given to work which may have some positive features, but is not at Masters standard: for example by lacking structure, having a poor-quality line of argument, or does not demonstrate sufficient application
10-29%	Bad fail	Represents a significant overall failure to achieve the appropriate learning outcomes at Masters standard.
1-9%	Very bad fail	A submission that does not attempt to address the module's specified learning outcomes. It will be considered a non-valid attempt and the module must be re-sat.
0%	Non submission or plagiarised	Work was not submitted or it was plagiarised.

How the programme is structured

The programme consists of four elements:

- A common core of Virtual and Augmented Reality modules that are shared between the pathways (60 credits)
- A core technical skills module that is specific to the pathways (15 credits)
- A wide range of optional modules that will allow students to enrich their learning and follow individual interests (45 credits)
- A large scale project and dissertation module, which may either be an academic project conducted at Goldsmiths, or an industry project conducted as part of a placement with a company that is doing relevant VR or AR work (60 credits)

Academic Year of Study 1 Full-Time

Common core

Module Title	Module Code	Credits	Level	Module Status
Introduction to Virtual Reality	IS71081A	15	7	Core
Mixed Realities	IS71098A	15	7	Core
Advanced Topics in Virtual and Augmented Reality	IS71097A	15	7	Core
Introduction to Programming for Games	IS71030A	15	7	Core

Pathway specific core module for 3D Graphics and User Experience Pathway

(NB student on the other pathway will be able to take at most one of these modules as an option)

Module Title	Module Code	Credits	Level	Module Status
Introduction to Modelling and Animation	IS74021A	15	7	Core (3D Graphics and User Experience Pathway)

Pathway specific core module for Programming and Computer Science Pathway

(NB student on the other pathway will be able to take at most one of these modules as an option)

Module Title	Module Code	Credits	Level	Module Status
Mathematics and Graphics for Computer Games 1	IS71021B	15	7	Core (Programming and Computer Science Pathway)

Optional Modules

Students will be able to take 45 credits from a wide range of modules from across the Department of Computing's masters portfolio, including core modules from the other pathway of the programming. The following list is indicative and may change from year to year.

Module Title	Module Code	Credits	Level	Module Status
Games and Interactive Entertainment Business and Practice	IS71025A	15	7	Option
Advanced Modelling and Animation	IS74023B	30	7	Option
Advanced Programming for Games and Interactive Graphics	IS71026B	15	7	Option
Mathematics and Graphics for Computer Games II	IS71022A	15	7	Option

Game Design and Games Analytics	IS74022A	15	7	Option
History of Computer Games, Art and Animation	IS74024A	15	7	Option
Tools and Middleware for Games and Special Effects	IS71024A	15	7	Option
AI for Games	IS71027B	15	7	Option
Workshops in Creative Coding 1	IS71014B	15	7	Option
Workshops in Creative Coding 2	IS71015B	15	7	Option
Data and Machine Learning for Artistic Practice	IS71074A	15	7	Option
Approaches to Play 1	IS71077A	15	7	Option
Approaches to Play 2	IS71078A	15	7	Option
Physical Computing 1	IS71102A	15	7	Option
Data Visualisation and the Web	IS71082A	15	7	Option

Project

Students on the MA (3D Graphics and User Experience) pathway will take:

Module Title	Module Code	Credits	Level	Module Status
Final Project in Virtual Reality (3D Graphics and User Experience Pathway)	IS71100A	60	7	Core

Students on the MSc (Programming and Computer Science) pathway will take:

Module Title	Module Code	Credits	Level	Module Status
Final Project in Virtual Reality (Programming and Computer Science)	IS71101A	60	7	Core

Academic Year of Study 1 Part-Time

Part time students will be given some flexibility in their choice of modules, but it will be recommended that

in their first year they take the following core and optional modules:

- Introduction to Virtual Reality (15 credits)
- Mixed Realities (15 credits)
- Introduction to Programming for Games (15 credits)
- Option Modules (15 credits)

Academic Year of Study 2 Part-Time

Part time students will be given some flexibility in their choice of modules, but it will be recommended that in their second year they take the following core modules:

- Advanced Topics in Virtual and Augmented Reality (15 credits)
- Pathway specific skills modules (15 credits)
- Option Modules (30 credits)
- Final Project (60 credits)

Students doing the 3 year part time pathway will do the project in their final year.

Academic support

Support for learning and wellbeing is provided in number of ways by departments and College support services who work collaboratively to ensure students get the right help to reach their best potential both academically and personally.

Students are allocated a personal tutor and a Senior Tutor in each department who has overall responsibility progress and welfare. Departments arrange regular communication to students in the form of mailings and meetings as well as regular progress reports and feedback on coursework and assignments. This is in addition to scheduled seminars, tutorials and lectures/workshops.

Every student is assigned a personal tutor who will meet with their student twice a year either face-to-face, as part of a group and/or electronically, the first of which normally takes place within the first few weeks of the first term. Personal tutors are also available to students throughout the year of study. These meetings aim to discuss progress on modules, discussion of the academic discipline and reports from previous years if available (for continuing students). This way progress, attendance, essay/coursework/assessment marks can be reviewed, and an informed discussion can be about how to strengthen learning and success.

Students are sent information about learning resources in the Library and on the VLE so that they have access to programme handbooks, programme information and support related information and guidance. Timetables are sent in advance of the start of term so that students can begin to manage their preparation and planning.

Taught sessions and lectures provide overviews of coursework themes, which students are encouraged to complement with intensive reading for presentation and discussion with peers at seminars. Coursework essays build on lectures and seminars, so students are encouraged to attend all taught sessions to build knowledge and their own understanding of their chosen discipline.

In depth feedback is provided for written assignments and essays via written feedback forms and formative feedback with module tutors/leads is provided to ensure that students' work is on the right track. Feedback comes in many forms and not only as a result of written comments on a marked essay.

Students are given feedback on developing projects and practice as they attend workshops and placements.

Students may be referred to specialist student services by department staff or they may access support services independently. Information about support services is clearly provided on the College Website and for new students through new starter information and induction/Welcome Week. Any support recommendations that are made are agreed with the student and communicated to the department so that adjustments to learning and teaching are able to be implemented at a department level and students can be reassured that arrangements are in place. Opportunities are provided for students to review their support arrangements should their circumstances change. The Inclusion and Learning Support and Wellbeing Teams maintain case loads of students and provide on-going support.

The Careers Service provides central support for skills enhancement, running the Gold Award Scheme and other co-curricular activities that are accredited via the higher education achievement report (HEAR).

The Academic Skills Centre works with academic departments offering bespoke academic literacy sessions. It also provides a programme of academic skills workshops and one-to-one provision throughout the year, which students can access directly at gold.ac.uk/asc/.

Links with employers, placement opportunities and career prospects

Our existing Computer Games masters programmes have had a very strong recruitment record for students finishing the course, with nearly all students achieving full-time employment within 3 months of leaving. Existing employers of previous MSc Games and Entertainment Students include SONY SCEE, Supermassive, SEGA Creative Assembly, Sports Interactive, GamesLoft, Rebellion, WeRInteractive, Frontier and GameSys. This has been greatly aided by the Summer Term placement scheme we organise where students work onsite at companies for an entire term.

The MA/MSc is expected to emulate this and our existing contacts at companies to lead to jobs for students following completion of the course. Moreover, previous MSc Games and Entertainment students have used their entrepreneurial skills gained on the course to start up companies and gain development contracts and investment. Our programme opens up multiple career options including:
- Games Developer specialising in Virtual and Augmented Reality Games on PC mobile or Sony PlayStation VR
- Creator of Virtual and Augmented Reality experiences for digital agencies specialising in contract work
- Virtual and Augmented Reality artist working either independently or within the context of creative SMEs or larger organisations such as the BBC
- Virtual and Augmented Reality creator associated with more traditional platforms, for example creating VR experiences linked to film, television or games
- Designer of Virtual or Mixed Reality tools for education, for example medical training
- Designer of Virtual or Mixed Reality apps for domains such as healthcare (including mental health), engineering or social media/remote conferencing
- As well as technical developer roles, students would also be well placed for roles such as junior producers in all of these industries.

Students might also develop their independent research questions, which could lead to postgraduate research, for example at the Intelligent Games and Game Intelligence Doctoral Training Centre.

The requirements of a Goldsmiths degree

Master's Degrees
All Master's degrees at Goldsmiths have a minimum value of 180 credits. Programmes are comprised of modules which have individual credit values. In order to be eligible for the award of a Master's degree students must have passed all modules on the programme.

Intermediate Exit Points
Some programmes incorporate intermediate exit points of Postgraduate Certificate and Postgraduate Diploma, which may be awarded on the successful completion of modules to the value of 60 credits or 120 credits respectively. The awards are made without classification.

Final Classification
There are four possible categories of final classification for Master's degrees: Distinction, Merit, Pass and Fail.

For further information, please refer to the Regulations for Taught Programmes which may be found here: http://www.gold.ac.uk/gam/taught-programmes/

Programme-specific rules and facts

Final degree classifications are based on 120 credits of taught modules and the Final Project and are assessed in proportion of 100% by coursework.

The PGCert requires any 60 credits of taught modules and the PGDip requires 120 credits (all taught modules).

In order to progress to the Final Project, students must fulfil the requirements for a pass at PGDip level (pass all 120 credits of taught modules).

The awards of PGCert and PGDip are made without classification. In order to be awarded the MA all modules must be passed.

Programme costs

General Programme Costs

In addition to your tuition fees, you will be responsible for meeting standard costs associated with your study. Find out more information here: https://www.gold.ac.uk/programme-costs

How teaching quality will be monitored

Goldsmiths employs a number of methods to ensure and enhance the quality of learning and teaching on its programmes.

Programmes and modules must be formally approved against national standards and are monitored throughout the year in departmental staff / student forums and through the completion of module evaluation questionnaires. Every programme also has at least one External Examiner who produces an annual report which comments on the standards of awards and student achievement.

This output is considered with other relevant data in the process of Annual Programme Review, to which all programmes are subject, and which aims to identify both good practice and issues which require resolution.

Every six years all programmes within a department are also subject to a broader periodic review. This aims to ensure that they remain current, that the procedures to maintain the standards of the awards are working effectively and the quality of the learning opportunities and information provided to students and applicants is appropriate.

Detailed information on all of these procedures are published on the webpages of the Quality Office (http://www.gold.ac.uk/quality/).