Goldsmiths
UNIVERSITY OF LONDON

Extended Reality

Programme specification

1. Programme details

Item	Information
a) Programme name (incl. pathways):	MSc Extended Reality Technologies (AI, VR, AR) Research Pathway MSc Extended Reality Technologies (AI, VR, AR) Internship Pathway MA Extended Reality Arts (AI, VR, AR) Research Pathway MA Extended Reality Arts (AI, VR, AR) Internship Pathway
b) Programme code(s)	730430, 730463, 730424, 730461
c) Programme credit value(s)	180 CATS 90 ECTS
d) Programme author(s)	Marco Gillies, Sylvia Pan
e) Entry requirements	2.2 equivalent in undergraduate degree
f) Academic year effective from	2027

2. Programme Aims & Overview

Aims

This programme aims to equip students with the technical, creative and thinking skills required to create complex immersive Extended Reality (XR) experiences using the latest AI methods and interaction technologies.

Overview

Digital technology is on the cusp of a revolution that will break away from the screen-based interaction of the 50 years. Virtual Reality, Augmented Reality, Haptic interaction, movement tracking, speech interaction, large language models, smart glasses, interactive music, the metaverse and location based interaction are just some of the wide range of emerging technologies that enable new kinds of immersive experience. We can step into entirely fantastical worlds, or see magical creatures in our real environment. We can talk to AI versions of our favourite movie characters, or meet our real friends in virtual clubs. Dancers can create their own music from their movements, or bands can create visuals from their music. Virtual pets can respond to our gestures, or we can feel the touch of a friend who lives on a different continent. Together we call these kinds of experience Extended Reality (XR) because they combine real and virtual world and bring our real bodies into the digital world.

All of these experiences rely on one important innovation: Artificial Intelligence. Machine Learning and

Foundation models are needed so that computers can understand our natural human behaviour and the complexities of the real world, and so respond realistically. However, most current AI interaction uses only text, which seems like a return to the command prompts used to interaction with computers before graphical user interface. We need a new interface paradigm for AI. Mar Gonzalez-Franco, head of Google's Blended Interactions Research and Devices and one of the designer of the Android XR operating system (and our friend) says that this new paradigm is Extended Reality. XR takes current AI out of its screen-based silo of text chat and image generation into the real world, enabling a huge new potentials.

This Masters programme will teach you the latest AI methods and novel interaction technologies, including VR, AR, Haptics, movement tracking and conversational interaction. You will use these skills to develop immersive experiences that escape the screens either into entirely virtual worlds (e.g. with VR headsets) or into the real world with Augmented Reality and virtual/physical installations.

This is an interdisciplinary masters that accepts students from both technical (e.g. computer science or engineering) or artistic (e.g. fine art, design or digital media) backgrounds and has you collaborate together just as you would in real industry settings. Our MA pathway teaches students from an arts background real, industry relevant technical skills and programming and our MSc pathway encourages technical students to develop their creative skills. They both teach important collaboration between disciplines and also the psychology and theory of extended reality.

This programme extends our previous, highly successful masters in Virtual and Augmented Reality to a wider range of emerging technologies, but keeps the hands-on, interdisciplinary and industry-focused approach that made the previous programme so popular with both students and employers. It also builds on the 30 years of experience of research in VR, AR, embodied interaction and AI, from the programme team: Sylvia Pan, Marco Gillies and Tara Collingwoode-Williams.

Extended 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. We have strong links with industry, including regular industry talks and demo days in which industry representatives visit to see you demo your work and give feedback. About 40% of students do internships in industry rather than a final research project. Of these almost all are offered permanent jobs in the company. This reflects the intense demand for the skills taught by the programme, which results in a large majority of students, whether they do internships or not being hired very rapidly after graduation. We also have many non-commercial collaborations, which result in collaborative projects, in which you will do an XR project with experts in a relevant field in Goldsmiths, other universities or other non-profit institutions such as museums or hospitals. Examples include healthcare, psychiatry, museums, social work, and the arts. Our collaborators have included institutions in the UK (e.g. Oxford, UCL), USA, Switzerland, Germany, Catalonia and Singapore.

The programme will culminate in a final project that will allow you to develop a complete, major XR 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. Students interested in an internship or industry placement should enrol on the respective internship pathway. Students who prefer to pursue a research or academic career,

should enrol on the Research pathways. Students might be able to switch between the two pathways during the year, on a case-by-case basis (if, for example a student on the internship pathway is unable to arrange an internship). When no otherwise specific, the names MA and MSc XR refer to both internship and research pathways, as they only differ in the nature of the final project.

3. External reference

Item	Information
a) FHEQ Level of Award:	7
b) UCAS Code(s):	N/A
c) HECoS Code(s):	(100363) Computer Animation and Visual Effects, (100368) Creative Computing, (100440) Digital Media, (100736) human-computer interaction
d) QAA Benchmark group:	Computing

4. Awards

Item	Information
a) Awarding institution:	Goldsmiths, University of London
b) Teaching institution:	Goldsmiths, University of London
c) Home School:	Computing **If other, name here:** N/A
d) School(s) also involved in teaching of the programme:	1. None 2. None 3. None **If other, name here:**
e) Entry awards:	☐ Foundation Cert ☐ CertHE ☐ DipHE ☐ PGCert ☐ PGDip
f) Interim exit awards:	☐ Foundation Cert ☐ CertHE ☐ DipHE ☒ PGCert ☒ PGDip
g) Final awards:	PGDip Extended Reality Technologies (AI, VR, AR) Research Pathway PGDip Extended Reality Technologies (AI, VR, AR) Research Pathway MA Extended Reality Technologies (AI, VR, AR) Research Pathway MSc Extended Reality Technologies (AI, VR, AR) Research Pathway PGDip Extended Reality Technologies (AI, VR, AR) Internship Pathway PGDip Extended Reality Technologies (AI, VR, AR) Internship Pathway MA Extended Reality Technologies (AI, VR, AR) Internship Pathway MSc Extended Reality Technologies (AI, VR, AR) Internship Pathway

5. Delivery

Item	Information	
a) Language of study:	English	
b) Valid intake points in year:	☐ January ☒ Sept/Oct ☐ Other If other, specify: N/A	
c) Mode of study:	On Campus Indicate the overall balance of teaching modes in the rows below. Row d) shows total hours of directed learning, with e) and f) showing how this is broken down in in-person vs. online learning, in hours and percentages.	
d) Total hours directed learning/year	**300**	
e) In-person hours	300	
f) Online hours	0	
g) Pace of study:	☒ Full time ☒ Part time	
h) Duration of programme	Full time: 1 ☒years ☐months Part time: 2 ☒years ☐months	
i) External accreditation:	N/A	
j) Apprenticeship Standard:	N/A	

6. Programme Learning Outcomes

Also, see the curriculum map at the end of document.

For UG exit awards, Learning Outcomes must be achieved in the level indicated below:

- CertHE = Level 4
- DipHE = Level 5

Learning outcomes are grouped in categories of:

- **Declarative learning** - knowledge, thinking & facts (D1-3)
- **Functional learning** - application of knowledge, thinking & facts (F1-3)
- **Professional and transferable skills and behaviours** (P1-3)

On successful completion of the programme, you will be able to:

(PGCert students will achieve LOs D1, D2, F2, P1 and P2)
(PGDip students will achieve LOs D1, D2, D3, F1, F2, P1 and P2)

	Learning Outcome	Level	Graduate Attribute
D1	Apply knowledge of the current state in the art of Extended Reality hardware and software technologies to select and implement appropriate technologies for a project	7	Diversity of perspective
D2	Apply knowledge of the psychological illusions and physiological effects of extended reality and their causes to design and/or critically evaluate virtual reality experience	7	Diversity of perspective
D3	Critically evaluate current research and practice in extended reality	7	Diversity of perspective
F1	Perform a research study in Extended Reality	7	Responsible agency
F2	Apply research results and contemporary approaches to practice in Extended Reality to the development of small and medium projects	7	Diversity of perspective
F3	Develop and evaluate a substantial Extended Reality experience within the context of academic research or professional industry practice, applying a range of knowledge and skills as is appropriate to the student's pathway.	7	Responsible agency
P1	Communicate effectively, both in writing and in presentations to an audience	7	Collaboration
P2	Work effectively in groups	7	Collaboration
P3	Plan and execute a substantial project under expert supervision	7	Responsible agency

7. Programme Structure

For Undergraduate programmes (UG), each level must amount to at least **120 CATS** (60 ECTS).

Postgraduate (PGT) programmes must amount to at least 180 CATS (90ECTS), with exception to interim exit awards.

Programmes are staged in **Phases**, where each Phase relates to an exit award.

Compulsory modules must be taken by all students.

Option modules – you must choose one or more of the options available to this programme at this level and point. The option modules available from this list may vary from year to year, depending on student numbers and staff availability. Selection takes place during your studies, not before.

Programme structure notes (where relevant):

The programme consists of four elements:

- A common core of Virtual and Augmented Reality modules that are shared between the pathways (75 credits)
- A compulsory 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 (30 credits)
- A large scale project and dissertation module, which may either be, depending on pathway, an academic project conducted at Goldsmiths, or an industry project conducted as part of a placement with a company that is doing relevant XR work (60 credits)

Phase 1 (FT)

Module Name	Code	Credit	Level	Type	Term	Year PT	Pathway
Virtual and Augmented Reality	IS71081	15	7	Compulsory	1	Y1	All
XR Development	IS74025A	15	7	Compulsory	1	Y1	All
Applied AI for Industry	IS71138A	15	7	Compulsory	1	Y2	All
Modelling & Animation 1	IS74021	15	7	Compulsory	1	Y2	MA (both pathways)
Mathematics for Games and V&AR	IS71021	15	7	Compulsory	1	Y2	MSc (both pathways)

Phase 2 (FT)

Module Name	Module Code	Credit	Level	Module Type	Term	Year PT	Pathway
Intelligent and Embodied Interaction	TBC	15	7	Compulsory	2	Y1	All
Advanced Topics in Virtual and Augmented Reality	IS71097	15	7	Compulsory	2	Y2	All
Modelling and Animation 2	IS74023	15	7	Option - Shared	2	N/A	MA (both pathways)
Game AI Programming	IS71027	15	7	Option - Shared	2	N/A	MSc (both pathway)

Module Name	Module Code	Credit	Level	Module Type	Term	Year PT	Pathway
Programming for Game Engines	IS71024	15	7	Option - Shared	2	N/A	MSc (both pathways)
Alternative Game Controller Design	IS71142	15	7	Option - Shared	2	N/A	All
Audio Experience for Games	S71122	15	7	Option - Shared	2	N/A	All
Escape Room Design and Immersive Theatre	IS71096	15	7	Option - Shared	2	N/A	All
Conversational Agents and Virtual Humans	IS71150A	15	7	Option - Shared	2	N/A	All
Motion capture techniques and digital embodiment	IS71114	15	7	Option - Shared	2	N/A	All
Interaction Science	IS71092	15	7	Option - Shared	2	N/A	All
Computer Graphics in the age of AI	IS71022	15	7	Option - Shared	2	N/A	All

Phase 3 (FT)

Module Name	Module Code	Credit	Level	Module Type	Term	Year PT	Pathway
Project in Extended Reality	IS71147	60	7	Compulsory	3	Y2	All

8. Learning, Teaching & Assessment

Learning & Teaching methods

Teaching will be via a range of formats to be as relevant as possible to the topic and learning outcomes. This may be through workshops, practical labs, lectures and seminars. It may have a mix of in-person and online activities, designed to give you the best learning experience and to make the

most out of your learning experience. You are expected to attend all of your timetabled learning activities.

Specifically, this programme will be taught in the following ways:
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Assessment modes and approaches

You will be assessed in a range ways throughout your course. These will be both Formative (for feedback and development), and Summative (required to pass and progress to the next level). Summative assessments are compulsory.

Feedback is a crucial part of your learning and development in this programme. You will receive feedback both on your Formative (work in progress) tasks/assessments, and your Summative (graded) assessments. This feedback will help the assessment to be a part of your learning, not just a test. It may be verbal, written or video based. Please engage with this feedback to improve your future work.

Specifically, this programme will be assessed in the following ways:
Exams may take a variety of forms, including project-based assessments and in-class examinations, depending on the learning outcomes of the module.

Assessment diet (number of assessments for compulsory modules)

Mode	Level 3	Level 4	Level 5	Level 6	Level 7	Total
Coursework	0	0	0	0	6	6
Exam	0	0	0	0	0	0
Live	0	0	0	0	4	4
Portfolio (multi-modal)	0	0	0	0	8	8
Practical / multimedia	0	0	0	0	0	0
Written	0	0	0	0	1	1
TOTAL:	**0**	**0**	**0**	**0**	**19**	**19**
Of which…	**Individual:**	**15**	**Group:**	**4**		

9. Other information

Item	Information
a) Assessment regulations	https://www.gold.ac.uk/gam/taught-programmes/assessment/
b) Placement opportunities	On the internship pathways students take a paid placement in place of an academic final project. We have a strong network of XR companies and studios and have a succeeded in placing a large number of students, the majority of which have gone on to permanent jobs in the

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	organisation. In additional to paid commercial placement, we offer the option of projects that are sponsored and co-supervised by non-profit organisations (e.g. healthcare) or other academic departments or institutions.
c) Programme-specific requirements	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).
d) Programme specific costs and resources	None
e) Employability and potential career opportunities	Our programme so far has a strong record of employability with the XR sector. Our graduates have received job offers at London-based creative studios such as Maze Theory, Dream Reality Interaction, Arcade; and internationally companies such as Meta, NetEase and Perfect World. Our alumni includes the lead developer of VR game, "The Pirate Queen" which won the Raindance Immersive 2021 Best Debut Award; another graduate was named in Bima 100, an award set up to recognise the UK's most influential people in digital & tech. Many of our students receive paid internships or become involved in funded research projects. Examples include an international research collaboration working on creating VR scenarios to train social workers, and a funded research project with Oxford University to create immersive museum experiences. Our programme opens 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

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	• As well as technical developer roles, students would also be well placed for roles such as junior producers in all these industries We have a strong record of students publishing in top research conference, IEEE VR. Many students might also develop their independent research questions, which could lead to postgraduate research. Students are supported from the start to the finish of this programme in order to understand the different potential career journeys they can follow and to build a portfolio of work to demonstrate their capability to gain employment or freelance work in that area. Assessment has been designed to facilitate this process through the development of transferable or soft skills listed in the section above. Regular guest lectures from industry support the development of sector knowledge and awareness of different career paths. One aspect of the design of our assessment is that we often work with external organisations to develop real world project briefs, particularly for the final project. For example, in the past students have worked on VR psychological interventions for the Department of Psychiatry at Oxford, have worked with a Swiss University to develop VR training for social workers, and with Archaeologists to visualise a theatre from the time of Shakespeare. We also partner with organisations to run hackathons, these including developing new concepts for one of HTC VIVEs new hardware devices and working with start up company to develop new games to help support people with ADHD. We also partner with an annual international hackathon with the Great Bao'en Temple Museum in Nanjing, with selected student flying art to take part. The School of Computing's External Advisory Board ensures relevance of all our programmes to the current and future needs of employers. All programmes are designed in consultation with employers to make sure you develop transferable skills to improve your career opportunities and you will be applying your skills to real-world problems through live project briefs and group projects. The board and other employers attend showcase events where you can present your ideas, get feedback and build important connections. We have dedicated employability resource within the school to build employer relations and manage additional initiatives to support your future career opportunities, including regular communication of external

Item	Information
	opportunities for mentoring and work experience and an annual Career week (a focussed week of career support every June in the school where you can access alumni panels by programme and a range of industry talks).

10. Academic support

There is a range of support available to you to give you the best possible chance of success in this programme.

Please see your tutors and student portal/VLE for details of what's available and how to access this support.

11. Curriculum map

Programme Learning Outcomes assessed by each module:

Module name	Code	Type	D1	D2	D3	F1	F2	F3	P1	P2	P3
Virtual and Augmented Reality	IS71081	Compulsory	☒	☒	☐	☒	☒	☐	☒	☒	☐
XR Development	new	Compulsory	☒	☐	☐	☒	☒	☐	☒	☒	☐
Applied AI for Industry	IS71138A	Compulsory	☒	☐	☐	☐	☒	☐	☒	☐	☐
Modelling & Animation 1	IS74021	Compulsory	☒	☐	☐	☐	☒	☐	☒	☐	☐
Mathematics for Games and V&AR	IS71021	Compulsory	☒	☐	☐	☐	☒	☐	☒	☐	☐
Intelligent and Embodied Interaction	new	Compulsory	☒	☒	☐	☐	☐	☐	☒	☒	☐
Advanced Topics in Virtual and Augmented Reality	IS71097	Compulsory	☒	☒	☒	☒	☒	☐	☒	☒	☐
Game AI Programming	IS71027	Option - Shared	☒	☐	☐	☐	☒	☐	☒	☐	☐
Modelling and Animation 2	IS74023	Option - Shared	☒	☐	☐	☐	☒	☐	☒	☐	☐
Programming for Game Engines	IS71024	Option - Shared	☒	☐	☐	☐	☒	☐	☒	☐	☐
Alternative Game Controller Design	IS71142	Option - Shared	☒	☐	☐	☐	☒	☐	☒	☐	☐
Audio Experience for Games	IS71122	Option - Shared	☒	☐	☐	☐	☒	☐	☒	☐	☐
Interactive Narrative and Digital Storytelling	IS71073	Option - Shared	☒	☐	☐	☐	☒	☐	☒	☐	☐
Escape Room Design and Immersive Theatre	IS71096	Option - Shared	☒	☐	☐	☐	☒	☐	☒	☐	☐
Conversational Agents and Virtual Humans	TBC	Option - Shared	☒	☐	☐	☐	☒	☐	☒	☐	☐
Motion capture techniques and digital embodiment	IS71114	Option - Shared	☒	☐	☐	☐	☒	☐	☒	☐	☐
Interaction Science	IS71092	Option - Shared	☒	☐	☐	☐	☒	☐	☒	☐	☐

Module name	Code	Type	D1	D2	D3	F1	F2	F3	P1	P2	P3
Project in Extended Reality	IS71147	Compulsory	☒	☒	☒	☒	☒	☒	☒	☒	☒
			☐	☐	☐	☐	☐	☐	☐	☐	☐