

IML481: Mixed Realities: Histories, Theories & Practices

Units: 4

Spring 2022 • Tuesday • 1pm-3:50pm

Location: SCI 311

Google Classroom: nnsu2jj

Instructor: Scott Fisher

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Office Hours: By Appt.

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Course Description

This course will be a comprehensive orientation to *mixed reality* (MxR), delving into its theories and histories while grounding students in a hands-on introduction to current tools and techniques.

The last several years have seen an explosion of interest in immersive media, with corresponding leaps in the various technological components – both hardware and software – that are required to make these experiences possible. There is of course a long history and prehistory to our current moment; *virtual reality* (VR) has been the ‘next big thing’ for several decades now, careening between numerous episodes of breathless excitement and disenchanting dismissal. However, this time around, VR and its related/overlapping reality domains (augmented, mixed) seem to have finally reached critical mass, and despite the inevitable backlashes, health warnings, burst hype bubbles, etc, have materialized, there is every reason to expect that development and innovation will continue at breakneck pace for the foreseeable future. Despite of all this excitement, there remain disagreements and controversies over fundamental aspects of the field: histories, definitions, descriptions, predictions and implications are all contested. (For instance, there is disagreement over the primacy of *virtual*, *augmented* and *mixed* reality (VR, AR, MxR), as well as acceptance of terms such as “cinematic VR”.)

This course will be a comprehensive orientation to this burgeoning field, delving into a wide range of theories, prehistories, and histories of immersive tech, while grounding students in a hands-on introduction to current tools and techniques. For the course, we are using the term *mixed reality* as the most inclusive category, while recognizing that any of the alternatives are at least mildly controversial (for instance, Microsoft has appropriated the term for their “Windows Mixed Reality” platform, creating no small amount of confusion).

We will explore the current state of *mixed reality* (MxR), its strengths, weaknesses, and possible trajectory in society. The class will be a combination of lecture, discussion, and hands-on experimentation/exploration, and will also compare and contrast with *virtual reality* (VR) and *augmented reality* (AR), to look at a range of possible mixed realities.

Topics to be covered:

- Prehistories (pre-cinematic, cinema, simulators, tele-technologies)
- Histories (from the 1950s through the present)
- Philosophical backgrounds & definitions
- Conceptual frameworks for MxR implementation

- Exploring and expanding the language of AR and MxR
- Technological & sensory components (360° imaging & audio, tracking, optics, stereoscopy, haptics, proprioception)
- Terminology & etymology (cyberspace, immersion, telepresence, VR, MxR, AR, cinematic VR)
- Representations in Media (literature, science fiction, cinema and television).
- Virtual Reality + Art
- Alternate technologies (CAVE, volumetric imaging, screen-based AR)
- Styles and genres (games, apps, simulations, narratives, installations)
- Related fields (ubiquitous/pervasive computing, projection mapping, holography, stereoscopic cinema, IoT, maker movement)

Learning Outcomes

Students will come out of this course with a comprehensive understanding of the key concepts of mixed reality, knowledge of its history and technology, as well as the skills necessary to build mixed reality applications. This course is an opportunity for interested and motivated students to get up to speed quickly, becoming knowledgeable and experienced MxR/VR/AR creative producers over the course of a semester.

Prerequisite(s): none

Technological Proficiency and Hardware/Software Recommended

One or more of the following:

- programming/coding experience in any current language (Processing, Java, Javascript, Python, C, C++, C#, Ruby, Python, etc).
- basic facility in Unity, a cross-platform game and graphics engine, or similar toolset
- basic facility in a 3D design program (Maya, 3DS Max, Cinema 4D, Blender, etc)

Recommended Readings and Supplementary Materials

Textbooks

- Immersed in Media: Telepresence in Everyday Life by Paul Skalski & Cheryl Campanella Bracken, editors
- Beginning Windows Mixed Reality Programming - For HoloLens and Mixed Reality Headsets by Sean Ong
- Augmented Reality: Principles and Practice (Usability) 1st Edition by Dieter Schmalstieg (Author), Tobias Hollerer (Author)
- The VR Book: Human-Centered Design for Virtual Reality by Jason Jerald
- PRESENCE: Virtual and Augmented Reality <https://direct.mit.edu/pvar>

Fiction

- Rainbows End by Vernor Vinge
- Neuromancer by William Gibson
- Ready Player One: A Novel by Ernest Cline
- Ray Bradbury: The Veldt (1951)

Movies/TV

- Creative Control
- World on a Wire (Fassbinder)
- Dennō Coil
- Black Mirror: “The Entire History of You” , “White Christmas” , “Playtest” , “Men Against Fire” , “Striking Vipers”.
- Philip K. Dick’s Electric Dreams

Podcasts

- Voices of VR Podcast <http://voicesofvr.com>

News Sites

- Next Reality <https://next.reality.news/>
- Road to VR <https://www.roadtovr.com>
- VR Scout <https://vrscout.com>
- Upload VR <https://uploadvr.com>
- VR Focus <https://www.vrfocus.com>
- Virtual Reality News <https://www.virtualreality-news.net>
- Windows Mixed Reality <https://www.reddit.com/r/WindowsMR/>
- Hololens Forum <https://forums.hololens.com/>
- Holodevelopers <https://holodevelopersslack.azurewebsites.net/>

Participation and Attendance Policy

MA+P classes depend on group work and in-class critique, which makes attendance crucial. You are expected to be present for every scheduled class session. If you must miss a class, please be sure to get any notes and assignments from a classmate so you do not fall behind.

For students attending class virtually in Zoom, please log in using your USC-enabled Zoom account for security purposes. It is also recommended that you keep your camera turned on so you can better interact with the class and participate in class activities.

If you feel that you are unable to participate in the ways listed above, please speak to your professor. Accommodations may be made for certain situations.

Grading Breakdown

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|-------------------------------|-----|
| • Class and Lab Participation | 15% |
| • Weekly Assignments | 10% |
| • Midterm Project | 25% |
| • Final Project | 50% |

Grading Scale

Course final grades will be determined using the following scale:

A	95-100	
A-	90-94	
B+	87-89	
B	83-86	
B-	80-82	
C+	77-79	
C	73-76	MINIMUM PASSING GRADE FOR MEDIA ARTS + PRACTICE MAJORS
C-	70-72	
D+	67-69	
D	63-66	
D-	60-62	MINIMUM PASSING GRADE FOR USC
F	59 and below	

Course Schedule: Weekly Breakdown

The following weekly schedule is subject to change Please consult Google Classroom for the most current information, readings, assignments, and due dates. <https://classroom.google.com/>

WEEK 1 (1/11/22) CLASS OVERVIEW AND INTRODUCTIONS

Topics

- Review syllabus and schedule
- Introductions and skills review
- Examples and demos of MxR experiences

WEEK 2 (1/18/22) INTRO TO MIXED REALITY CONCEPTS

Topics

- Discussion of mixed reality concepts and terminology.
- Mozilla Hubs & Spoke workshop #1

Assignment:

1. Browse MxR news sites (listed above): Find something that catches your interest and post a link on slack #xrnews channel along with a comment and/or a question. Be prepared to discuss your choice at beginning of next class.

Readings:

- Ivan Sutherland: The Ultimate Display (1965)
<http://worrydream.com/refs/Sutherland%20-%20The%20Ultimate%20Display.pdf>
- Mark Billinghurst: What is Mixed Reality? (2017)
<https://medium.com/@marknb00/what-is-mixed-reality-60e5cc284330>
- What is mixed reality? (Microsoft) <https://docs.microsoft.com/en-us/windows/mixed-reality/mixed-reality>

WEEK 3 (1/25/22) HISTORY OF AR, VR AND MXR #1

Topics

- History of AR, VR, and MxR: A look at where we've been.
- Mozilla Hubs & Spoke workshop #2

Assignment:

1. Post to #xrnews channel

Readings:

- "Before and after cinema: reconnecting the virtual with the analog" (Hoberman)
- "Film: The Original Immersive Medium" (Neuendorf and Lieberman)

WEEK 4 (2/1/22) HISTORY OF AR, VR AND MXR #2

Topics

- History of AR, VR, and MxR: A look at where we've been.
- Tvorì workshop #1

Assignment

1. Post to #xrnews channel
2. Build a Hubs world and share URL with class (post to Slack).

Readings

- Recent Advances in Augmented Reality (Azuma et al 2001)
<https://www.cc.gatech.edu/~blair/papers/ARsurveyCGA.pdf>

WEEK 5 (2/8/22) MXR DESIGN FICTIONS

Topics

- Brainstorming future mixed reality environments and experiences.
- Tvorì workshop #2

Assignments

1. Post to #xrnews channel

Readings

- Design Fiction Julian Bleeker March 2009
 - http://drbfw5wfjlxon.cloudfront.net/writing/DesignFiction_WebEdition.pdf
- Mirrorworlds (Keiichi Matsuda) 2018
<http://blog.leapmotion.com/mirrorworlds/>
- Resistance is Futile: Reading Science Fiction Alongside Ubiquitous Computing (Paul Dourish) 2009
<https://www.dourish.com/publications/2009/scifi-puc-draft.pdf>

WEEK 6 (2/15/22) CURRENT DEVELOPMENTS IN MXR

Topics

- A look at where MXR is being used.
- Social VR workshop (Spatial.io, altspace, vrchat, framevr, etc.)

Assignments :

1. Post to #xrnews channel
2. MxR logline and MxR Design Fiction proposal draft

Readings:

- "Enhancing Our Lives with Immersive Virtual Reality" (Slater & Sanchez-Vives) 2016
<https://www.frontiersin.org/articles/10.3389/frobt.2016.00074/full>

WEEK 7 (2/22/22) MIDTERM PRESENTATIONS

Topics

- MxR Design fiction presentations.

Assignments :

3. Post to #xrnews channel
4. MxR Design Fiction proposal final

Readings:

- None

WEEK 8 (3/1/22) UI AND UX FOR MXR

Topics

- Designing human centric MxR experiences.
- Snap Lens Studio workshop

Assignments:

1. Post to #xrnews channel

Readings:

- Designing for Mixed Reality. Dan Escudero, Microsoft Mixed Reality Academy Design Lead
- UX 101 for Virtual and Mixed Reality—Part 1: Physicality - Jacob Payne 2017
<https://uxplanet.org/ux-101-for-virtual-and-mixed-reality-part-1-physicality-3fed072f371>
- UX 101 for Virtual and Mixed Reality—Part 2: Senses - Jacob Payne 2017
<https://uxplanet.org/ux-101-for-virtual-and-mixed-reality-part-2-working-with-the-senses-c39fbd502494>
- You're doing Mixed Reality wrong – M Eifler 2017
<https://medium.com/@blinkpop/youre-doing-mixed-reality-wrong-d32aa54ae8af>
- How Immersive Sound Brings Mixed Reality to Life Alice Bonasio 2017
<https://medium.com/microsoft-design/how-immersive-sound-brings-mixed-reality-to-life-914214c461c0>

WEEK 9 (3/8/22) ETHICS AND ISSUES IN MIXED REALITY

Topics

- Discussion of issues around ethics and representations of reality.
- Reality Composer workshop

Assignment:

1. Post to #xrnews channel

Readings

- What Are Your Augmented Reality Property Rights? (Fiona Mcevoy) 2018

<https://slate.com/technology/2018/06/can-you-prevent-augmented-reality-ads-from-appearing-on-your-house.html>

- Not a Film and Not an Empathy Machine - Janet Murray
<https://immerse.news/not-a-film-and-not-an-empathy-machine-48b63b0eda93>
- The Case Against Reality - Don Hoffman - 2016
<https://www.theatlantic.com/science/archive/2016/04/the-illusion-of-reality/479559/>
- The Unethical Future of Mixed Reality Storytelling – Millard, et al.
- XR Talks: Who Owns Your Augmented Reality - Timoni West talk
<https://arinsider.co/2019/03/15/xr-talks-who-owns-your-augmented-reality/>
- The Good and the Bad of Escaping to Virtual Reality
<https://www.theatlantic.com/health/archive/2015/02/the-good-and-the-bad-of-escaping-to-virtual-reality/385134/> (edited)

WEEK 10 (3/15/22) SPRING BREAK – NO CLASS

WEEK 11 (3/22/22) FUTURES OF MXR

Topics

- New directions and concepts in mixed reality research including 5G, Spatial Computing, AR Cloud, and the Metaverse.
- WebXR workshop (Enklu, 8thWall, etc.)

Assignments:

1. Post to #xrnews channel
2. Work on final project proposals for presentation

Readings:

- The Economy of the Metaverse | Interview with Epic CEO Tim Sweeney
<https://medium.com/ggdigest/the-economy-of-the-metaverse-interview-with-epic-ceo-tim-sweeney-1822eed01ddf>
- Who Will Own the Metaverse, Balabanovic, M.
<https://medium.com/ggdigest/the-economy-of-the-metaverse-interview-with-epic-ceo-tim-sweeney-1822eed01ddf>
- Collaborative AR: Comparing Approaches, David Smith
<https://medium.com/@davidsmith/collaborative-ar-comparing-approaches-e0d57b542a13>
- EMOVAC: Designing a Mixed Reality Experience for 5G, Nicholson, B., Lam, F., Warhol, D., Fisher, S.S.; IEEE GEM, New Haven, 2019.

WEEK 12 (3/29/22) FINAL PROJECT PROPOSALS (PRESENTATIONS)

Topics

- Present final project proposals

Assignments:

1. Post to #xrnews channel
2. Proposal for Final project(s)

Readings:

- None

WEEK 13 (4/5/22) FIELD TRIP

WEEK 14 (4/12/22) FINAL PROJECT PREPARATION

Topics

- In Class Project development.

Assignment:

1. Final project production & prototyping

WEEK 15 (4/19/22) FINAL PROJECT RUN THROUGH AND PLAY TESTING

Topics

- In Class Project run through and playtesting

Assignment:

1. Final project production & prototyping

WEEK 16 (4/26/22) FINAL PROJECT PRESENTATIONS

ACADEMIC POLICIES

Land Acknowledgement Statement:

For those participating from the LA Basin, we acknowledge our presence on the traditional, ancestral and unceded territory of the Tongva and Chumash peoples.

For those who are elsewhere, please visit Native-Land.ca to discover the Original People of your home.

Disability “Acknowledgement”

In the spirit of disability culture, please feel free to stim, stretch, knit, doodle, move around, change seats, do yoga or do what feels right to your bodymind.

SCA Diversity and Inclusion Statement:

Diversity and Inclusion are foundational to the SCA community. We are committed to fostering a welcoming and supportive environment where students of all identities and backgrounds can flourish. The classroom should be a space for open discussion of ideas and self-expression; however, SCA will not tolerate verbal or written abuse, threats, harassment, intimidation or violence against person or property. If students are concerned about these matters in the classroom setting they are encouraged to contact their SCA Diversity and Inclusion Liaison, <http://cinema.usc.edu/about/diversity.cfm>; e-mail diversity@cinema.usc.edu. You can also report discrimination based on a protected class here <https://equity.usc.edu/harassment-or-discrimination/>

Disruptive Student Behavior:

Behavior that persistently or grossly interferes with classroom activities is considered disruptive behavior and may be subject to disciplinary action. Such behavior inhibits other students' ability to learn and an instructor's ability to teach. A student responsible for disruptive behavior may be required to leave class pending discussion and resolution of the problem and may be reported to the Office of Student Judicial Affairs for disciplinary action.

Academic Conduct:

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, "Behavior Violating University Standards" <https://policy.usc.edu/scampus-part-b/>. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Statement on Fair Use:

Fair use is a legal principle that defines certain limitations on the exclusive rights of copyright holders. MA+P projects are produced with fair use doctrines in mind using its four pillars: (1) the purpose and character of use, (2) the nature of the copyrighted work, (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole, and (4) the effect of the use upon the potential market for or value of the copyrighted work. Generally speaking, this means you must only use as much of a copyrighted work as is necessary to make your point, and you must cite your sources accordingly.

Citation Guidelines:

We assert that work produced in our classes is covered under the Doctrine of Fair Use. In order to make this claim, however, all projects must include academically appropriate citations in the form of a References section, which covers all sources, in order to receive a passing grade. The References section is either included in the project itself or as a separate document, as appropriate. For citation purposes, we follow *Kairos Journal of Rhetoric, Technology and Pedagogy* style guide; Kairos uses [APA format](#), which is slightly modified and whose general guidelines and specific examples may be found here: <http://kairos.technorhetoric.net/styleguide.html#apa>

Computer Code:

Computer code is often shared and reused. This is appropriate in a MA+P course unless otherwise directed by the assignment. If you do use code, you should attribute it. Please follow these protocols from MIT which call for placing a comment in one's code with a URL to the original source, a note if it was adapted, and the date of retrieval: <https://integrity.mit.edu/handbook/writing-code>

Research:

Need to do research but don't know where to start? Searching for a book, article, or data to support your argument? Not sure how to cite a source in your bibliography? Ask a librarian!

Research help is available:

- In person and by phone, chat and email at Ask a Librarian
- Through research guides and FAQs
- By contacting your subject librarian

USC Libraries: <https://libraries.usc.edu/>

COVID-19 Information for Students Coming to Campus

USC has COVID-19 and health protocols requirements for students who will be coming to campus.

Please consult the [USC COVID-19 resource center website](#) for the latest COVID-19 testing and health protocol requirements. Requirements are continuously updated so please check frequently.

Students should also stay informed with the "We Are USC" portal:

<https://we-are.usc.edu/students/>

Students are also expected to follow the [University's Expectations on Student Behavior](#).

PLEASE NOTE:

FOOD AND DRINKS (OTHER THAN WATER) ARE NOT PERMITTED IN ANY INSTRUCTIONAL SPACES IN THE SCHOOL OF CINEMATIC ARTS COMPLEX

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Support Systems:

Counseling and Mental Health - (213) 740-9355(WELL), press "0" after hours – 24/7 on call

studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

Student Health Leave Coordinator – 213-740-0411 or uscsupport@usc.edu

<https://campussupport.usc.edu/students/health-and-wellness/health-leave-of-absence/>

Located in the USC Campus Support and Intervention office, the Health Leave Coordinator processes requests for health leaves of absence and advocates for students taking such leaves when needed.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call

suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention and Services (RSVP) - (213) 740-9355(WELL), press "0" after hours

– 24/7 on call studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

USC Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086 or eeotix@usc.edu

<https://eeotix.usc.edu/>

Find information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations. The university also prohibits sexual assault, non-consensual sexual contact, sexual misconduct, intimate partner violence, stalking, malicious dissuasion, retaliation, and violation of interim measures.

Reporting Incidents of Bias or Harassment - (213) 740-5086

usc-advocate.symplicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - (213) 740-0776

<https://osas.usc.edu/>

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Campus Support & Intervention - (213) 821-4710

campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

ombuds.usc.edu

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concerns

