IML481: Mixed Realities: Histories, Theories & Practices

Units: 4
Fall 2019 • Tuesday • 1-3:50pm
Location: SCI 311 MEML (Mobile & Environmental Media Lab)

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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 disenchanted 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, that are sure to materialize, there is every reason to expect that development and innovation will continue at breakneck pace for the foreseeable future. Despite 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, 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 Objectives
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 Required
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)

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

**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
- Philip K. Dick’s Electric Dreams

**Podcasts**
- Voices of VR Podcast [http://voicesofvr.com](http://voicesofvr.com)

**News Sites**
- Next Reality [https://next.reality.news/](https://next.reality.news/)
- Road to VR [https://www.roadtovr.com](https://www.roadtovr.com)
- VR Scout [https://vrscout.com](https://vrscout.com)
- Upload VR [https://uploadvr.com](https://uploadvr.com)
- VR Focus [https://www.vrfocus.com](https://www.vrfocus.com)
- Virtual Reality News [https://www.virtualreality-news.net](https://www.virtualreality-news.net)
- Holodevelopers [https://holodevelopersslack.azurewebsites.net/](https://holodevelopersslack.azurewebsites.net/)

**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. Students are allowed two absences before a reduction in grade. Tardiness or leaving class early for (0 to 15 minutes) will be considered ½ an absence. Missing more than 30 minutes of a class is considered an absence. **After your second absence, each additional absence will lower your final grade by 5%**.

**Grading Breakdown**
- 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 the course wiki for the most current information, assignments and due dates.

WEEK 1 (8/27/19) CLASS OVERVIEW AND INTRODUCTIONS
Topics
- Review syllabus and schedule
- Introductions and skills review
- Examples and demos of MxR experiences

Assignment for next week:
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 for next week:
- Ivan Sutherland: The Ultimate Display (1965)
  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 2 (9/3/19) INTRO TO MIXED REALITY CONCEPTS
Topics
- Discussion of mixed reality concepts and terminology.
- Unity workshop #1 - Kitbashing
Assignment for next week:
1. Post to #xrnews channel

Readings for next week:
- “Enhancing Our Lives with Immersive Virtual Reality” (Slater & Sanchez-Vives) 2016

WEEK 3 (9/10/19) MIXED REALITY PAST, PRESENT AND FUTURE
Topics
- Discussion of mixed reality in the larger VR/AR continuum.
- Unity workshop #2 - Adding Animation

Assignment for next week
1. Post to #xrnews channel

Readings for next week
- “Before and after cinema: reconnecting the virtual with the analog” (Hoberman)
- “Film: The Original Immersive Medium” (Neuendorf and Lieberman)
- Recent Advances in Augmented Reality (Azuma et al 2001)
  https://www.cc.gatech.edu/~blair/papers/ARsurveyCGA.pdf

WEEK 4 (9/17/19) HISTORY OF AR, VR AND MXR
Topics
- History of AR, VR, and MxR: A look at where we’ve been.
- Unity workshop #3 – Adding scripts

Assignment for next week:
1. Post to #xrnews channel

Readings for next week (due in 2 weeks):
- Design Fiction Julian Bleecker March2009
- Mirrorworlds (Keiichi Matsuda) 2018
  http://blog.leapmotion.com/mirrorworlds/

WEEK 5 (9/24/19) LAB SESSION: SCAN & CAPTURE TECH
Topics
- Workshop: 3D Object Scanning with Occipital Structure Scanner
- Workshop: Animation & Rigging with Mixamo
Assignments
1. Post to #xrnews channel

Readings for next week
- Design Fiction Julian Bleecker March 2009
- Mirrorworlds (Keiichi Matsuda) 2018
  http://blog.leapmotion.com/mirrorworlds/

WEEK 6 (10/1/19) MXR DESIGN FICTIONS
Topics
- Brainstorming future mixed reality environments and experiences.
- Unity workshop #4 - Building for HMDs

Assignments for next week (due in 2 weeks):
1. Post to #xrnews channel
2. MxR Design Fiction proposal (3-person teams)

Readings for next week:
- Resistance is Futile: Reading Science Fiction Alongside Ubiquitous Computing (Paul Dourish) 2009

WEEK 7 (10/8/19) MXR DESIGN FICTIONS #2
Topics
- Brainstorming future mixed reality environments and experiences.
- Unity workshop #5 - Building for HMDs

Assignments for next week (due in 2 weeks):
3. Post to #xrnews channel
4. MxR Design Fiction proposal (3-person teams)

Readings for next week:

WEEK 8 (10/15/19) FIELD TRIP
Topics
- Visit to commercial MxR installation.

Assignments for next week:
1. Post to #xrnews channel
2. Design Fiction production, prepare presentation
Readings for next week:

WEEK 9 (10/22/19) MXR DESIGN FICTION: MIDTERM PRESENTATIONS

Topics
- Design fiction presentations.

Assignment for next week:
1. Post to #xrnews channel

Readings for next week
- What Are Your Augmented Reality Property Rights? (Fiona Mcevoy) 2018
- Not a Film and Not an Empathy Machine - Janet Murray
- The Case Against Reality - Don Hoffman - 2016

WEEK 10 (10/29/19) ETHICS AND ISSUES IN MIXED REALITY

Topics
- Discussion of issues around ethics and representations of reality.
- Unity 5: Building for HMDs 2

Assignments for next week:
- 1. Post to #xrnews channel
- 2. Prepare final project proposals for presentation

Readings for next week:

WEEK 11 (11/5/19) FINAL PROJECT PROPOSALS (PRESENTATIONS)

Topics

Assignments for next week:
- 1. Post to #xrnews channel
- 2. Final project production & prototyping

Readings for next week:
• UX 101 for Virtual and Mixed Reality—Part 2: Senses - Jacob Payne 2017
• 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 12 (11/12/19) UI AND UX FOR MXR
Topics
  • Designing human centric MxR experiences.

Assignment for next week:
  1. Final project production & prototyping

WEEK 13 (11/19/19) FINAL PROJECT PREPARATION
Topics
  • In Class Project development.

Assignment for next week:
  1. Final project production & prototyping

WEEK 14 (11/26/19) THANKSGIVING BREAK

WEEK 15 12/3/19 FINAL PROJECT RUN-THROUGH & PLAY TESTING
Topics
  • In Class Project development.

Assignment for next week:
  1. Final project production

WEEK 16 (12/10/18) FINAL PROJECT PRESENTATIONS (EXAM WEEK)

ACADEMIC POLICIES
Diversity 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/

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://integrati

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
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.

Support Systems:

Student Health Counseling Services - (213) 740-7711 – 24/7 on call engemannshc.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 – 213-821-4710
Located in the USC Support and Advocacy office, the Health Leave Coordinator processes requests for health leaves of absence and advocates for students taking such leaves when needed.
https://policy.usc.edu/student-health-leave-absence/

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 Services (RSVP) - (213) 740-4900 – 24/7 on call engemannshc.usc.edu/rsvp
Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) | Title IX - (213) 740-5086 equity.usc.edu, titleix.usc.edu
Information about how to get help or help a survivor of 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.

Bias Assessment Response and Support - (213) 740-2421 studentaffairs.usc.edu/bias-assessment-response-support
Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs - (213) 740-0776 dsp.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 Support and Advocacy** - (213) 821-4710  
studentaffairs.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 Trojan Food Pantry**  
https://campusactivities.usc.edu/trojan-food-pantry/  
Any currently enrolled USC student who does not have a dining hall meal plan or whose plan’s swipes have been fully used and is experiencing a food emergency/food insecurity qualify for the services of the Trojan Food Pantry.

**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) 442-120 – 24/7 on call  
dps.usc.edu  
Non-emergency assistance or information.

**PLEASE NOTE:**  
FOOD AND DRINKS (OTHER THAN WATER) ARE NOT PERMITTED IN ANY INSTRUCTIONAL SPACES IN THE CINEMATIC ARTS COMPLEX