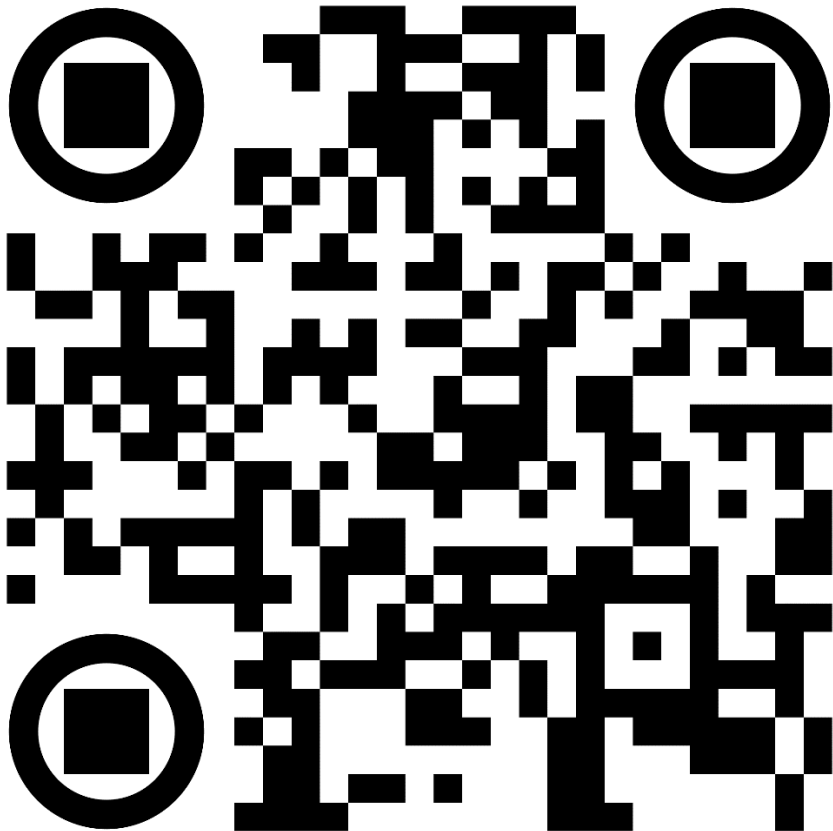


ARCHDES 701 | ADVANCED DESIGN 2 | TOPIC OUTLINE | SEM 2 2019

The Advanced Design 2 topics are structured around the theme of 'urban patterns'. At their broadest, the topics foreground large-scale urban investigations concerning infrastructure, context, landscape, architecture, relationships between these factors and patterns of inhabitation thus supported. Crafted propositions are to be developed that demonstrate an exploration of the urban patterns theme across a range of scales.

arc/sec Lab: Uwe Rieger & Yanan Liu

Cyber-Physical Cities



GENERAL COURSE INFORMATION

Course :	Advanced Design 2 ARCHDES701
Points Value:	30 points
Course Director:	Andrew Douglas andrew.douglas@auckland.ac.nz
Course Co-ordinator:	Uwe Rieger u.rieger@auckland.ac.nz
Studio Teacher:	Assoc. Prof. Uwe Rieger & Yinan Liu
Contact:	u.rieger@auckland.ac.nz , yinan.liu@auckland.ac.nz
Location:	TBC
Hours:	Tuesday and Friday 1:00-5:00pm

For all further general course information see the ARCHDES701 COURSE OUTLINE in the FILES folder on CANVAS.

Cyber-Physical Cities

A research design studio at arc/sec Lab for Cross Reality Architecture and Interactive Systems supported by the Digital Research Hub.

The Cyber-Physical Cities (CPC) studio will investigate advanced strategies for the application of digital spatial technologies in an urban context. Cyber-Physical Systems (CPS) are describe the integration computational and physical processes. Embedded computers, sensors and networks monitor and control the physical processes. These are real-time feedback loops where physical processes affect computations and vice versa.

Embedded in the urban fabric CPS applications can range from objects (i.e. e-scooter sharing), to building scale (i.e. environmental house technology) and to urban systems (i.e smart cities infrastructure).

Our studio will specifically focus on the design implantations of CPS technologies and will look at hybrid design strategies, which combine digital information with physical properties. We will conduct small-scale experiments and extrapolate the results to produce speculative views on a digitally enhanced urban fabric. The final design ideas will be presented in the form of small-scale prototypical experiments and large digital renderings using 3D projection technology.

The studio is supported by the Digital Research Hub (DRH). We will introduce Arduino micro controller kits, sensing technologies and full colour 3D visualisation using active shutter glasses.

The focus of the course will be on 3 areas:

- Theory: expanded exploration of functional and programmatic applications of cyber-physical systems within architecture and urban design
- Experimental testing: well considered CPS components that emerge to a new understanding of urban fabric
- Aesthetic: graphical development of an urban environment and spatial presentation in immersive 3D environments

In the first half of the semester, we will work in small teams to experiment with CPS components and 3D visualisation principals. In the second half, you are asked to individually translate the experiments into an urban design concept presented in inspiring visual renderings on a large 3D panoramic projection screen.

Skills for your Future

By introducing and experimenting with cutting edge technology the CPC studio is setup with two goals in mind:

1. To actively contribute to the development of new knowledge in the new research field of Tactile Data and Programmable Matter
2. To equip the participants of this studio with unique professional skill sets for contemporary architectural practice, which increasingly requires the creative and productive use of advanced digital technologies.

Pre-Requisites

The CPC studio does not require any pre-knowledge on specific technologies, software or programming. Only curiosity and interest is needed. The studio will be supported by the Digital Research Hub (DRH) and we will run a series of workshops to introduce the gaming engine *Unity 3D*, *Sensor technology*, 3D projection systems and digital fabrication technologies.

Consider joining the CPC studio if you are interested in one or more of the following:

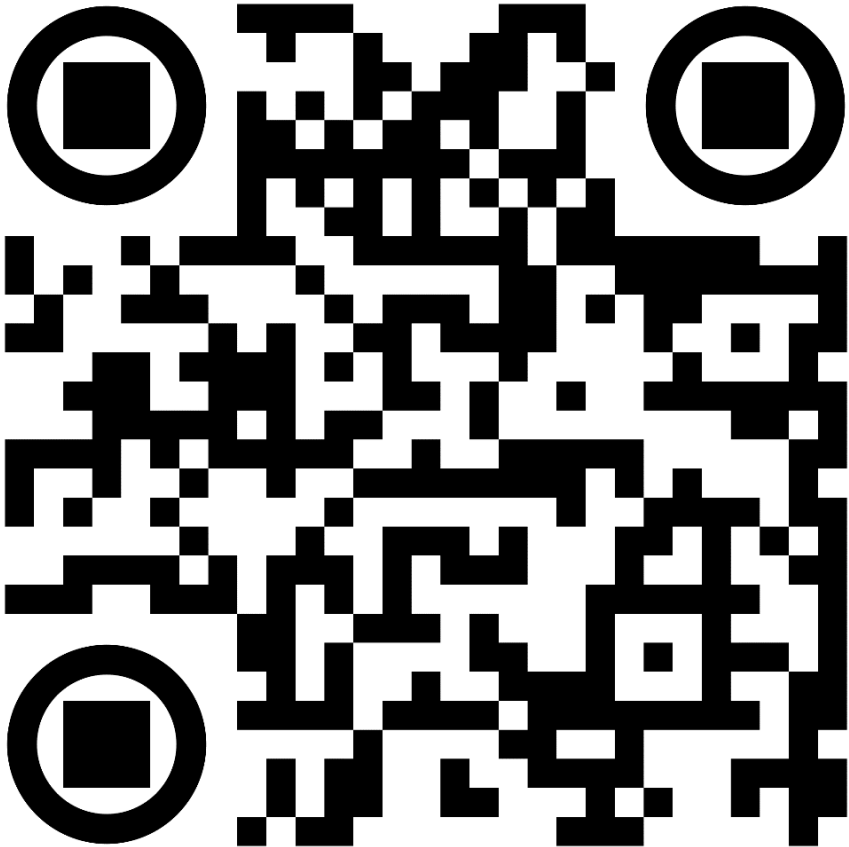
- Graphic design
- 3D animations
- Model building
- Architectural construction
- Performative design
- Interaction design
- Programming
- Digital technologies

TOPIC STRUCTURE AND CONTENT

Design Research

The project is embedded in the research agenda at the **arc/sec Lab** for *Cross Reality Architecture and Interactive Systems*. The lab connects long term research projects with undergraduate and postgraduate courses. Collectively we explore concepts of Real Time *Reactive Architecture* through a fusion of the digital and physical world.

The **arc/sec Lab** uses interactive prototypes as the driving vehicle for the exploration and communication of new dimensions in architectural space. The Lab's research is a starting point for both, the development of practice oriented applications and the speculation of how our cities and buildings might change in the future. www.arc-sec.com



Week	Date	Event
Week 1	Mon 22.7	12:00 All architecture meeting, rm 311 3:00 AD2 staff presentations and studio ballot
	Tue 23.6	AD2 Studio classes commence
	Fri 26.7	CPS intro
Week 2	Tue 30.7	Digital workshop
	Fri 2.8	CPS experiments
Week 3	Tue 6.8	Digital workshop
	Fri 9.8	CPS experiments
Week 4	Tue 13.8	Workshop
	Fri 16.8	CPS + 3D experiments
Week 5	Tue 20.8	Workshop
	Fri 23.8	CPS + 3D experiments
Week 6	Tue 27.8	CPS + 3D experiments
	Fri 30.8	AD2 Mid semester crits
MID-SEMESTER BREAK		
Week 7	Tue 17.9	Digital workshop
	Fri 20.9	3D experiments
Week 8	Tue 24.9	Workshop
	Fri 27.9	3D experiments
Week 9	Tue 1.10	Workshop
	Fri 4.10	CPS + 3D experiments
Week 10	Tue 8.10	CPC development
	Fri 11.10	CPS + 3D experiments
Week 11	Tue 15.10	CPC development
	Fri 18.10	3D experiments
Week 12	Tue 22.10	5-6pm Pin-up – Exhibition Space
	Wed 23.10	AD2 Final Studio Reviews

The above schedule is subject to changes according to overall course progress and requirements

RESOURCES

Tutorials

The studio is supported with tutorials by the Digital Research Hub

Unity online tutorials

Arduino online tutorials

Websites

“Augmented Human Lab” AHLab Accessed 14.7.19. <http://ahlab.org/>

“Empathic Computing Lab” Accessed 14.7.19.

<http://empathiccomputing.org/>

“First look at THE VOID.” youtube. Accessed 14.7.19
<https://www.youtube.com/watch?v=cML814JD09g>
“Examples of Augmented Reality in Retail”. Creative Guerrilla Marketing.
Accessed 14.7.19. <http://www.creativeguerrillamarketing.com/augmented-reality/>
“Hyper-Reality.” Hyper-Reality. Accessed 14.7.19. <http://hyper-reality.co/>
“MIT – Tangible Media Group” Accessed 14.7.19.
<https://www.media.mit.edu/groups/tangible-media/overview/>
“MIT – Mediated Matter Group” Accessed 14.7.19.
<https://www.media.mit.edu/groups/mediated-matter/overview/>
“MIT- Responsive Environments Group” Accessed 14.7.19.
<https://www.media.mit.edu/groups/responsive-environments/overview/>
“Samsung’s new flagship NYC building isn’t a retail store at all.” TheVerge.
Accessed 14.7.19..
<https://www.theverge.com/2016/2/23/11099014/samsung-837-nyc-walkthrough>
Smith, J. Greg. “Augmented (hyper)Reality: An interview with Keiichi Matsuda”. berfrois. Accessed 14.7.19.
<http://www.berfrois.com/2011/01/augmented-hyperreality/>
“Visions of Commuting” Visions of Computing.org ,Accessed 14.7.19.
https://visionsofcomputing.wiki.cs.st-andrews.ac.uk/index.php/Vision_videos

Conferences, Journals and Books

Ishii, Hiroshi. “Tangible Bits: Beyond Pixels.” In Proceedings of the Second International Conference on Tangible and Embedded Interaction, Bonn, Germany, February 18-20, 2008, 15-25. New York: ACM Press, 2008.

Hiroshi Ishii; Dávid Lakatos; Leonardo Bonanni; Jean-Baptiste Labrune, Radical Atoms: Beyond Tangible Bits, toward Transformable Materials, interactions 19, no. 1 (2012)

A Horan, Thomas. Digital places: Building our city of bits. Washington, D.C.: ULI-The Urban Land Institute, 2000

Brouwer, Joke, Arjen Mulder, Brian Massumi, Detlef Mertins, Lars Spuybroek, Moortje Marres, and Christian Hubler. Interact Or Die. Rotterdam: V2_Publishing-NAI Uitgevers, 2007

Candy, Linda and Sam Ferguson. Interactive Experience in the Digital Age: Evaluating a New Art Practice Cham, New York: Springer, 2014

Galitz, Wilbert O. The essential guide to user interface design: an introduction to GUI design principles and techniques. John Wiley & Sons, 2007.

Heinich, Nadin. Digital Utopia: on Dynamic Architectures, Digital Sensuality and Spaces of Tomorrow. Berlin: Akademie der Künste, 2012

Kurosu, Masaaki. Human-Computer Interaction. Interaction Modalities and Techniques. Springer Berlin Heidelberg, 2013.

Kwastek, Katja. Aesthetics of Interaction in Digital Art, Cambridge, MA: MIT Press, 2013.

Oosterhuis, Kas. Towards a New Kind of Building: Tag, make, Move, Evolve. Rotterdam: NAI, 2011

Munster, Anna. Materializing new media: Embodiment in information aesthetics. UPNE, 2011.

Sundstrom, Petra, Alex Taylor, Katja Grufberg, Niklas Wirstrom, Jordi Solsona Belenguer, Marcus Lunden. "Inspirational Bits: Towards a Shared Understanding of the Digital Material." In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Vancouver, Canada, May 07-12, 2011, 1561-1570. New York: ACM, 2011.

Wiberg, Mikael. "Interaction, new materials & computing - Beyond the disappearing computer, towards material interactions." Materials and Design 90, (2016): 1200-1206.

REQUIRED PRODUCTION

In the first part of the semester, we will build physical and digital models, develop high-end graphics, experiment with sensors and program interactive behaviour.

The final design presentation will consist of 3 parts:

1. The demonstration of a small prototypical CPS system
2. 3D presentation renderings of a Cyber-Physical City
3. The hand in of an individual A4 report with a focus development of your work throughout the project (drawings, photos and short condensed text).

DESIGN REPORT

Advanced Design 2 requires the preparation of a **Design Report**. In 2019 this will be prepared in a workshop as part of the core course taught concurrently with studio, *ARCHGEN 703 Design as Research*, where it will account for %40 of the grade. While assessed as part of the Design as Research course it will be focussed on the studio project and should be refined and re-submitted to your studio teacher in week 10 so that it can be circulated to the critics allowing them to prepare ahead of the final review.

ASSESSMENT & FEEDBACK

This course is assessed as 100% coursework. Conversational feedback is given throughout the semester. Written feedback, with indicative grading, is given at a date around the mid-point of the semester. All further information

regarding assessment is available in the ARCHDES 701 Advanced Design 2 Course Outline (on Canvas).

LEARNING OUTCOMES

General Course Outcomes & [Specific Outcomes for this Brief](#)

On successful completion of this course students should be able to:

- *Theory*: Show evidence of development of critical thinking and conceptual consistency throughout the design process.
Theory: To gain an understanding of the of the concept of CPS and its relationship to dynamic architectural space and control systems
- *Architectonics*: Demonstrate abilities to advance conceptual thinking and design propositions through identifying and addressing issues of materiality, structure and construction.
Architectonics: To explore new architectural and urban design opportunities through real time responsive construction and spaces
- *Performance*: Show abilities to advance conceptual thinking and design propositions through interrogating and addressing in depth the natural environmental, contextual, and programmatic factors underlying the project.
Performance: To develop the an understanding of responsive environments and user interaction on a building and urban scale
- *Form and Space*: Demonstrate skill in the development of three dimensional architectural form and space, both exterior and interior.
Form and space: To explore the point where the technical and aesthetic aspects of CPS meet to create the disciple of architecture
- *Media*: Display skill in the communication and development of conceptual, preliminary and developed design propositions through the strategic use of architectural media.
Media: To develop aesthetically sophisticated 3D visuals and models

