UNSW SYDNEY | Australia's Global University

Built Environment

BENV2001
Emerging Digital Technologies

TBC

3+ Abbreviated Course Outline – T3

Disclaimer

This abbreviated course outline is indicative of the outcomes, delivery and assessment. While Course Learning Outcomes will remain constant, other details may be subject to change. The full and most accurate course outline will be available in Moodle.

1. COURSE STAFF

Course Convenor	TBC
Email	TBC

2. COURSE DETAILS

Credit Points: 6 UoC

Learning Activity	Hours per week
Lecture	1
Tutorial	4
Online learning activity	1

Description

Digital technologies play an important role in our daily life and influence as well processes and workflows in the architecture, engineering and construction industry. Students in this course will comprehend the technical and operational principles of emerging digital technologies and identify applications of emerging digital technologies in and for the design of the built environment. This course will give students the opportunity to familiarize themselves with two emerging digital technologies that can be chosen out of a pool of four different technologies. At present, the course offers the following four skills trajectories: ADVANCED DIGITAL FABRICATION; ROBOTICS; GAMING; AR&VR. Students need to choose TWO out of the four prior to their enrolment possible combinations are:

- ADVANCED DIGITAL FABRICATION / ROBOTICS (Strong fabrication focus)
- GAMING / AR&VR (Strong synthetic environments focus)
- ADVANCED DIGITAL FABRICATION / AR&VR (Mixed focus leaning to Processes in Construction)
- GAMING / ROBOTICS (Mixed focus leaning to Human / Machine Interaction)

At the end of the course students can demonstrate skills in operating emerging digital technologies and apply emerging digital technologies in their own design projects and professional work.

Each module of the above will be a five-week block with 1 hour lecture / 4 hour tutorial / 1 hour online per week. The knowledge gained in the block will be assessed after the first 3 weeks and in the last week (fifth week) of the teaching block. The assignment is structured as one assessment with an ‘interim’ and ‘final’ component. Each module has a 1:15-20 staff student ratio and modules are either taught in the Design Futures Lab workshop or at the BE Computer Labs.

Program Learning Outcomes (PLOs)

This course addresses the following Computational Design Program Learning Outcomes:

1. Synthesise interdisciplinary knowledge of cultural, natural, and technological systems in local and global contexts.
2. Apply interdisciplinary knowledge using computational design thinking and methods to built environment challenges.
3. Apply computational design knowledge and skills for professional work and, or further learning.
4. Practice the ethical application of digital and computational technologies in and for the design of the built environment.

Course Learning Outcomes (CLOs) with Alignment to PLOs and Assessment

CLO #	CLO Statement	PLO #	Related Assessment
CLO 1	Comprehend the technical and operational principles of emerging digital technologies.	1, 2	Assessment 1(a) / 2(a) Comprehension is defined through understanding developments, evolution and application of two out of the four skills trajectories.
CLO 2	Demonstrate skills in operating emerging digital technologies	4	Assessment 1(a) / 2(a) Being trained and have completed WH&S.
CLO 3	Identify applications of emerging digital technologies in and for the design of the built environment.	3	Assessment 1(b) / 2(b) Capable of challenging the boundaries of their disciplinary understanding through emerging digital technologies.
CLO 4	Apply emerging digital technologies in their own design projects and professional work002E	2, 3	Assessment 1(a) / 1(b) / 2(a) / 2(b) Applying skills and knowledge gained on design project.

3. ASSESSMENT

All the deliverables are designed to guide the students through a research investigation, from conceptual thinking to design development. In addition, students are required to demonstrate a high level of collaboration and communication, as well as the capacity to learn independently.

Assessment task	Length	Weight	CLO Assessed	Due Date
1 (a) Emerging Digital Technology Project 1 Demonstrate their level of technical skill in how they can operate the new tool (Advanced Digital Fabrication **OR** Gaming). Apply these technical skills (Advanced Digital Fabrication **OR** Gaming) on disciplinary context.	10 Minutes / Person	30%	1, 2, 3, 4	Week 03
1 (b) Emerging Digital Technology Project 1 Demonstrate how to apply fundamental skills (Advanced Digital Fabrication **OR** Gaming) gain in the course to a design exercise. Communicate complex ideas through the gained technical skills (Advanced Digital Fabrication **OR** Gaming).	15 Minutes / Person	20%	1, 2, 3, 4	Week 05

2 (a) Emerging Digital Technology Project 2 Demonstrate their level of technical skill in how they can operate the new tool (Robotics **OR** AR&VR). Apply these technical skills (Robotics **OR** AR&VR) on disciplinary context.	10 Minutes / Person	30%	1, 2, 3, 4	Week 08
2 (b) Emerging Digital Technology Project 2 Demonstrate how to apply fundamental skills (Robotics **OR** AR&VR) gain in the course to a design exercise. Communicate complex ideas through the gained technical skills (Robotics **OR** AR&VR).	15 Minutes / Person	20%	1, 2, 3, 4	Week 10

4. WEEKLY COURSE SCHEDULE

Depending which of the following four skills trajectories: ADVANCED DIGITAL FABRICATION; ROBOTICS; GAMING; AR&VR student has chosen one OR the other Topic [Module] and Activity [Learning opportunity] will apply.

Week]	Topic	Activity	Related CLO
Week 1	**Advanced Digital Fabrication** Lecture: Subtractive and Adaptive fabrication	Workshop: WH&S introduction to CNC mill. Demonstrate and operate the new tool via a given designed object (2D as well as 3D object) and assembly of result till week 3.	1, 2, 3, 4
	Gaming Lecture: Unity and Vuforia platforms and their role in Built Environment	Workshop: Bring Using Maya to model and manipulate form.	1, 2, 3, 4
Week 2	**Advanced Digital Fabrication** Lecture: Designing in and for Subtractive and Adaptive fabrication	Workshop: Demonstrate and operate both CNC (in groups of 7) under supervision to design and optimize tooling paths and patterns for Assessment in week 3.	1, 2, 3, 4
	Gaming Lecture: Designing for Gaming environments	Workshop: Maya as a simulation tool	1, 2, 3, 4
Week 3	**Advanced Digital Fabrication** Lecture: Design to Production I	**Presenting Assessment 1(a)** 2D / 3D fabricated object	1, 2, 3, 4

	Gaming Lecture: Data driven design	**Presenting Assessment 1(a)** Designed and simulated artefact in Maya.	1, 2, 3, 4
Week 4	**Advanced Digital Fabrication** Lecture: Design to Production II	Workshop: Design to production workflow in and for your discipline.	1, 2, 3, 4
	Gaming Lecture: Data driven design	Workshop: Data set integration using MEL script.	1, 2, 3, 4
Week 5	**Advanced Digital Fabrication** Lecture: Design to Production II	**Presenting Assessment 1 (b)** Design to production workflow in and for your discipline.	1, 2, 3, 4
	Gaming Lecture: Data driven design	**Presenting Assessment 1 (b)** Data set integration and simulation in a gaming environment.	1, 2, 3, 4
Week 6	**Robotics** Lecture: Introduction to robotics	Workshop: WH&S introduction to KuKa robots. Demonstrate and operate the new tool via a given designed object and assembly of result till week 3.	1, 2, 3, 4
	AR / VR Lecture: Technological and cultural overview of synthetic environments	Workshop: Operating AR headsets (Oculus Rift) AR / MR headsets (HoloLens)	1, 2, 3, 4
Week 7	**Robotics** Lecture: Robots in Architecture I	Workshop: Demonstrate and operate the new tool via a given designed object and assembly of result till week 3.	1, 2, 3, 4
	AR / VR Lecture: Fologram – use of MR in the built environment	Workshop: Bringing data into Oculus Rift and HoloLens.	1, 2, 3, 4
Week 8	**Robotics** Lecture: Robots in Architecture II	**Presenting Assessment 2(a)** Robot fabricated prototype of one component that will lead to the assembled whole structure for Week 10.	1, 2, 3, 4

	AR / VR Lecture: Ceci tuera cela – new design documentation through MR	**Presenting Assessment 2(a)** 3D model in HoloLens using Fologram software to assist and help with manufacturing and fabrication.	1, 2, 3, 4
Week 9	**Robotics** Lecture: Robots in Architecture III	Workshop: Fabricating with robots in and for the built environment.	1, 2, 3, 4
	AR / VR Lecture: Process – reengineering.	Workshop: Scheduling fabrication and construction in AR / VR environment	1, 2, 3, 4
Week 10	**Robotics** Lecture: Robots in Architecture – Case study BVN & Sydney Uni	**Presenting Assessment 2 (b)** Robot Fabricated structure in combination with scheduling fabrication and construction in AR / VR environment	1, 2, 3, 4
	AR / VR Lecture: Centaur Pod – Case Study Arup & UNSW CoDe	**Presenting Assessment 2 (b)** Scheduling fabrication and construction in AR / VR environment in combination with robot fabricated structure	1, 2, 3, 4