UNIVERSITY of NICOSIA

Course Syllabus

Course Code	Course Title	ECTS Credits
ARCH-571DL	Theory and Evolution of Computational Design	10
Prerequisites	**Department**	**Semester**
None	Architecture	Fall
Type of Course	**Field**	**Language of Instruction**
Required	Architecture + Computation	English
Level of Course	**Lecturer(s)**	**Year of Study**
2nd Cycle	TBA	1st
Mode of Delivery	**Work Placement**	**Co-requisites**
Distance Learning	N/A	None

Objectives of the Course:

The main objectives of the course are to:

- To develop an in-depth knowledge and understanding of key concepts of computational design and parametric tools in architecture.
- To enable students to appreciate the significance of post-1990s computational tools development and their impact on the architectural practice.
- To encourage students to establish a connection between the evolution of computational design in architecture and the development of parametric software tools in other disciplines.
- To explore the theoretical understanding needed to capture, control and shape the innumerable proliferation of information found in the rapidly changing discipline of computational design.
- To establish a link between the evolution of computational tools and architectural practices that procured / assisted this evolution through applied design research.
- To encourage students to examine key concepts of parametric design through comparison of physical and digital forms of computation and experimentation.
- To identify reference texts required to build understanding that will accumulatively mature into critical theoretical positions in computational design and digital fabrication.
- To explore case studies of existing digital fabrication projects to test analytic capability and develop a vocabulary of computational design in architecture.
- To develop an advanced awareness of how the development of digital, computational and parametric tools procures implications on design, structure, construction, shape and form of architecture products.

Learning Outcomes:

After completion of the course students are expected to be able to:

1. Demonstrate knowledge and understanding of key concepts of the theory behind the computational design discipline.
2. Have developed an appreciation of historic and theoretical references underpinning computational design in architecture.
3. Take a critical personalised position in relation to issues of computational design and digital fabrication in architecture.
4. Acquire a large vocabulary of established computational techniques, software tools, fabrication systems and the terminology used in these.
5. Evidence a developing 'analytic capability' through the ability to understand published text / drawings / 3D Models of computational design strategies.
6. Interpret how computational techniques in design, optimisation and construction are integrated in the generation and realisation of architectural projects.

Course Contents:

1. Theoretical Positions on Computational Design in Architecture
2. Key concepts of Digital Design in Architecture
3. 3D Modelling tools
4. Parametric software
5. CAD/CAM
6. Bio-Tectonics
7. Design Optimisation
8. Performance Simulation
9. Growth and Form in Nature
10. Natural Patterns and their formations

Learning Activities and Teaching Methods:

PowerPoint and articulate presentations, comparative analysis, self-analysis, self-assessment, individual support and feedback, tutorials, case study analysis

Assessment Methods:

The lecture course is assessed by the submission of coursework (assignments):

- Formative assessment, assignments, group research, presentations, feedback, discussions, final essay, final exam.
- Presentations and short writings that will accumulatively set personalised theoretical positions on a range of computational design concepts (as introduced via lectures, directed readings and research).

- Comparative Analyses between physical and digital forms of computation, experimentation and existing projects via group work on weekly basis. The case studies are presented by students via two opposing groups (physical / digital) procuring a discussion as the main analytical tool.
- Final Exam. A thorough comparative analysis of a key computational design concept presented through a series of case-studies.
- The assignments will be submitted incrementally throughout the semester and collated into a holistic body of work as a final submission.

Required Textbooks / Reading:

Title	Author(s)	Publisher	Year	ISBN
AD: Computational Design Thinking	Achim Menges, Sean Ahuquist	John Wiley & Sons	2011	0470665653
An Evolutionary Architecture	John Frazer	AA Press	1995	1870890477

Recommended Textbooks / Reading:

Title	Author(s)	Publisher	Year	ISBN
Pattern Formation in Nature	Philip Ball	Oxford University Press	1999	0198502435
On Growth and Form	D'Arcy Wentworth Thomson	Cambridge University Press	1992	0521437768
Finding Form: Towards an Architecture of the Minimal	Frei Otto	Edition Axel Menges	1996	3930698668
The Work of Frei Otto	Ludwig Glaeser	Museum of Modern Art	1972	0870703331
Digital Tectonics	N. Leach, D. Tumbull, C. Williams (ed.)	Academy Press	2004	0470857293

Assemblage 41: a Critical Journal of Architecture and Design Culture	K. Michael Hays, Alicia Kennedy	MIT Press	2000	B004HSJ6BA
An autobiographical Monologue/Scenario	Buckminster Fuller	St. Martins Press	1980	0312106785
Informal	Cecil Balmond	Prestel	2007	3791337769
Crossover	Cecil Balmond	Prestel	2013	3791345222
Animate Form	Gregg Lynn	Princeton Arch.Press	1999	1568980833
AD: Computational Design Thinking	Achim Menges, Sean Ahuquist	John Wiley & Sons	2011	0470665653
AD: Design Through Making	Bob Sheil	John Wiley & Sons	2005	0470090936
AD: Patterns of Architecture	Mark Garcia	John Wiley & Sons	2009	0470699590
Soft Architecture Machines	Nicholas Negroponte	MIT Press	1975	0262140187