



Course Syllabus

Course Code	Course Title	ECTS Credits
ARCH-462	Advanced Computational Design	4
Prerequisites	Department	Semester
ARCH-362	Architecture	Spring
Type of Course	Field	Language of Instruction
Major Elective	Architecture	English
Level of Course	Lecturer	Year of Study
1 st Cycle	Michail Georgiou	4 th
Mode of Delivery	Work Placement	Corequisites
Face to face	N/A	-

Course Objectives:

The main objectives of the course are to:

- Enhance the participants' skills in advanced computational methods through the use of high-end CAD tools such as Graphical Algorithm editors, third-party plugins and scripting for controlling objective data and informing designs.
- Introduce a performance-based design approach by generating responsive systems which follow the design intentions and incorporate environmental or other constraints.
- Address multi-objective design problems by employing optimization techniques.
- Extract, analyze and visualize design data for information or representation.
- Introduce the participants to advanced digital fabrication tools and technologies including Robotics, Rapid Manufacturing, 3d Scanning, Virtual Reality, Augmented Reality and UAVs
- Introduce participants to scripting and customized computational tools through lectures and demonstrations
- Connect academia and industry through site visits and lectures at realized projects and industrial establishments exhibiting applications of computational design.

Learning Outcomes:

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

1. Identify the applications of advanced computational design for the construction industry.
2. Illustrate and implement computer graphical programming for design applications
3. Evaluate multi-objective design problems by employing optimization techniques.
4. Develop and modify advanced, performative computational models
5. Use 3rd party plugins to inform designs against environmental, and other constrains

6. Recognize the need for scripting to address specific computational problems.
7. Distinguish large amounts of computational data.
8. Appraise the use of advanced digital fabrication tools and technologies for design purposes.

Course Content:

- Parametric-associative design logic (Revision of basic notions taught in ARCH-362)
- Advanced Computational Design applications and limitations
- Performance Based and Multi-objective design - optimization techniques
- Advanced Computational Geometries
- Mathematical Concepts for Computational Design
- Designing with Lists and Data Trees
- Simulating Environmental Performance
- Acquiring and Managing Performance Data
- Designing using Data
- Introduction to Scripting and Object Orientated Programming
- Industrial digital fabrication tools, technologies and applications

Learning Activities and Teaching Methods:

Lectures, Computer Demonstrations, Discussions, Site Visits, Field Trips, Presentations, Practical Exercises and Assignments

Assessment Methods:

Presentation, Homework, Final Project and Attendance

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Grasshoper Primer 3rd Edition	ModeLab	Robert McNeel & Associates	2017	http://grasshopperprimer.com
Lecturer's Notes / Presentations	Michail Georgiou			

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Meredith M., lasch A. (ed.), Sasaki M., (ed),	From Control to Design: Parametric/Algorithmic Architecture	Actar	2008	8496540790 978- 8496540798
LadyBug Primer	Mostapha Sadeghipour Roudsari		2018	http://www.grasshopper3d.com/group/ladybug
Otto, F. and Rasch B.,	Finding Form: Towards an Architecture of the	Axel Menges	1996	3930698668
Fabio Gramazio, Matthias Kohler, Jan Willmann	The Robotic Touch: How Robots Change Architecture	Park Books	2014	3906027376