



## Course Syllabus

<b>Course Code</b>	<b>Course Title</b>	<b>ECTS Credits</b>
ARCH-570DL	Digital Fabrication	10
<b>Prerequisites</b>	<b>Department</b>	<b>Semester</b>
None	Architecture	Fall
<b>Type of Course</b>	<b>Field</b>	<b>Language of Instruction</b>
Required	Design + Fabrication	English
<b>Level of Course</b>	<b>Lecturer(s)</b>	<b>Year of Study</b>
2 <sup>nd</sup> Cycle	Michalis Georgiou / Odysseas Georgiou	1 <sup>st</sup>
<b>Mode of Delivery</b>	<b>Work Placement</b>	<b>Co-requisites</b>
Distance Learning	N/A	None

### Objectives of the Course:

The main objectives of the course are to:

- Develop an in depth knowledge and understanding of key concepts in digital fabrication (3D printing, basic programming, computer controlled cutting and computer controlled machining)
- Achieve basic knowledge of computer-aided design, electronics programming and interactions development.
- Teach students to produce both 2D and 3D graphic files for use on fabrication machines.
- Introduce different kinds of design software with an emphasis on open source software.
- Introduce the wide spectrum of electronics programming software with an emphasis on open source software.
- Demonstrate and apply the active use of a laser cutter, a CNC machine, a vinyl cutter, a robotic arm, a 3D printer and pre-fabricated PCB boards (Arduinos, Raspberry Pi's etc)
- Introduce students to the wide range of input and output sensors as well as PCB boards available in the market
- Teach the implementation of such devices on students' models aiming for human/computer interactions in simple forms.
- Develop an advanced awareness of materials, their possibilities, capabilities and physical restrictions.
- Teach students how to identify and implement all necessary procedures to take an idea from envisioning through to final prototype.
- Provide a deeper understanding of technological implications on design procedures and digital fabrication
- Give students a spherical, hands-on experience of design, structure, longevity, sustainability.
- Understand the possibilities of open source practice

**Learning Outcomes:**

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

1. Are able to produce 2D and 3D graphic files for use on fabrication machines through using open source and commercial applications.
2. Implement and practice basic principles of digital design and programming
3. Understand concepts of 3D printing, basic code programming, computer controlled cutting and computer controlled machining
4. Use a 3D printer, a CNC milling machine, a robotic arm and a laser cutter.
5. Produce basic code files for input sensors and output devices
6. Are able to transfer those codes on PCB boards and connect them successfully to the input and output devices.
7. Design interactions between sensors and applications.
8. Have developed an understanding of materials, possibilities and restrictions
9. Plan and implement steps to materialize an idea
10. Have acquired enough knowledge to evaluate their project and identify steps for development.
11. Participate and Contribute to the open source community.

**Course Contents:**

1. Introduction to digital fabrication, the Fab movement and open source concept
2. Introduction to CAD Modeling and open source software (Rhino, Grasshopper, AutoCAD, FreeCAD)
3. Implementing 2D and 3D modelling techniques
4. Importing/ exporting/ DWG/ DXF/ DGN/ IFC Bitmap.3ds/ STL/ IGS/ GCODE
5. Creating suitable files for communication with all available machines
6. 3D Printing
7. CNC Milling
8. Laser Cutting
9. Robotic Arm Cutting/ Sculpting
10. Circuits with input and output devices
11. Basic Coding (eg "Arduino IDE", "Processing")

**Learning Activities and Teaching Methods:**

Lectures, Computer Demonstrations, Workshops, Tutorials, Discussions, Presentations, Practical Exercises and Assignments.

**Assessment Methods:**

Homework, Project, Mid-Term, Presentation, Final Project, Final Exam

**Required Textbooks / Reading:**

Title	Author(s)	Publisher	Year	ISBN
Architecture in the Digital Age: Design and Manufacturing	Kolarevic B.	Taylor and Francis	2005	041538141 X

**Recommended Textbooks / Reading:**

Title	Author(s)	Publisher	Year	ISBN
Making It: Manufacturing Techniques for Product Design	Chris Lefteri	Laurence King	2012	1856697495
Materials for Design	Chris Lefteri	Laurence King	2014	1780673442
Contemporary Architecture and the Digital Design Process	Peter Szalapaj	Architectural Press, Oxford U.K.	2005	0750657162
Digital Fabrications: Architectural and Material Techniques.	Iwamoto, L.	Princeton Architectural Press	2009	9781568987
3D Printing and Laser Cutting	Geary J. & Renshaw D.	Ian Allan Publishing	2016	0711038414
Making Simple Robots	Ceceri K.	Maker Media	2015	1457183633
The Art of Tinkering	Wilkinson K.	Weldon Owen	2014	1616286091
Make a Raspberry Pi-Controlled Robot	Donat W.	Maker Media	2014	1457186039
The Maker movement Manifesto	Hatch M.	McGraw-Hill Professional	2013	0071821120
Understanding 3D Printing	Williams A.	Amazon Media	2013	ASIN:B00DS8RAS G (Kindle Edition)