Course guide
290807 - AADT2 - Advanced Architectural Design Techniques II

Last modified: 08/07/2025

Unit in charge:	Vallès School of Architecture
Teaching unit:	753 - TA - Department of Architectural Technology.

Degree: MASTER'S DEGREE IN ARCHITECTURAL DESIGN ECOLOGY IN THE DIGITAL AGE (Syllabus 2025). (Compulsory subject).

Academic year: 2025   **ECTS Credits:** 5.0   **Languages:** English

LECTURER

Coordinating lecturer:	Academic Coordination: Lluís Ortega
Others:	Teaching faculty: Course 1: Advanced Fabricating: Enrique Soriano Course 2: Advanced Structural Design and Construction: Marta Domènech and David López

PRIOR SKILLS

No previous skills required

REQUIREMENTS

No previous skills required

TEACHING METHODOLOGY

Course 1: Advanced Fabricating
The course is organized in 5 blocks. All sessions will be based on participatory lecture, cooperative work and project-based learning.
Course 2: Structural Design and Construction
Classes will combine lecture format with project-based learning.

LEARNING OBJECTIVES OF THE SUBJECT

K2.1 Examine advanced design and fabrication techniques in architectural projects.
S5.2 Experiment with the use of digital fabrication technologies in the production of models and mock-ups.
S9.2 Use digital technology critically.
C2.1 Apply all the possibilities of digital technology and simulation and prediction models in the creation, development, and evaluation of the architectural project.
C5.1 Develop projects in teams and take on responsibilities in production management.
*k (knowledge); S(Skills); C (Competences)

CONTENTS

title english

Description:
Course 1: Advanced Fabricating
• Laser Cutting – From Flat to Curved
Introduction to laser cutting workflow and constraints
Geometry preparation: developable surfaces, mesh unfolding, and unrolling
Mapping 3D forms to 2D sheets (e.g., strip models, surface tessellation)
CAM preparation for laser labelling and nesting with OpenNest
• CNC Milling – Subtractive 2.5D and 3D Techniques
Introduction to CNC hardware, axes, and materials
RhinoCAM basics: defining stock, tools, operations (pocketing, profiling, drilling)
Toolpath strategies
Exporting G-code and setup for machine control
• 3D Printing – Additive Manufacturing
Overview of 3D printing technologies (FDM, SLA, etc.)
Modelling for printing: manifold geometry, wall thickness, orientation
Slicing software: infill, supports, layer height, time estimation
Exporting G-code and practical printing considerations
• Robotic Fabrication – Routing with a 6-Axis Arm
Introduction to robotic arms in design and architecture
Design path strategies for routing or sculpting
Generating toolpaths and custom instructions via Grasshopper plugins
Practical simulation and export
• Fabrication and Assembly Workshop
Students will fabricate and assemble their hybrid object
Emphasis on interlocking/joint strategies and tolerances
Peer feedback, iteration, and final documentation

Course 2: Advanced Structural Design and Construction
The coursework is structured around five workshop-style seminars that aim to conduct applied research on architectural systems, incorporating advanced computational tools for both calculation and design.
Students will integrate conceptual foundations with hands-on applications to explore the relationship between materiality, design, and structure. The seminar will culminate in the construction of a full-scale (1:1) prototype, designed by the student working groups. This prototype will synthesize the lessons learned and allow for experimentation with the possibilities and limitations of the selected materials and construction systems.
Students will develop an understanding of the intrinsic properties of various materials and learn how to apply them optimally within specific construction, structural, and manufacturing systems.
This approach fosters the ability to move beyond conventional applications of known materials, adapting them to new demands and emerging design and building technologies.
Students will leave the course with a solid technical foundation and, more importantly, with the capacity to question, experiment, and respond creatively to the evolving landscape of architecture.

Full-or-part-time: 125h
Laboratory classes: 45h
Self study : 80h

GRADING SYSTEM

The subject is organized based on two courses. Each as an independent grade. The final grade will be calculated based on the following percentages.
Course 1: Advanced Fabricating (33%)
Course 2: Advanced Structural Design and Construction (66%)

EXAMINATION RULES.

Course 1: Advanced Fabricating
60% Fabrication Assignments (process, accuracy, integration of techniques)
20% Final Objects & Presentation (design quality, craft, articulation of concept)
20% Class Participation (discussion, engagement, group work)

Course 2: Advanced Structural Design and Construction
The continuous evaluation of the course is conducted through the submission of individual and group assignments, as well as practical exercises, with one assignment corresponding to each of the five thematic blocks. Each assignment will contribute a maximum of 2 points (out of 10) to the final course grade.
The work carried out during the prototype construction phase will also be graded. Attendance and active participation in the prototype construction are mandatory to pass the course.

BIBLIOGRAPHY

Basic:
- Architecture in the digital age : design and manufacturing. New York ; London: Spon Press, 2003. ISBN 0415278201.
- Gramazio, Fabio. Digital materiality in architecture. Baden: Lars Müller Publishers, 2008. ISBN 9783037781227.
- Ball, Philip. The self-made tapestry : pattern formation in nature. Oxford: Oxford University Press, 2001. ISBN 0198502443.
- Reiser, Jesse. Atlas of novel tectonics. New York (N.Y.): Princeton Architectural Press, cop. 2006. ISBN 1568985541.
- Allen, Edward; Zalewski, Waclaw. Form and forces : designing efficient, expressive structures. Hoboken, N.J.: John Wiley & Sons, cop. 2010. ISBN 9780470174654.
- Pottmann, Helmut. Architectural geometry. Exton, PA: Bentley Institute Press, 2007. ISBN 9781934493045.
- Re-inventing construction. Berlin : Zurich: Ruby ; Holcim Foundation for Sustainable Construction, 2010. ISBN 9783981343625.
- The materials book. Berlin: Ruby Press, 2020. ISBN 9783944074320.
- Tedeschi, Arturo. AAD_Algorithms-aided design : parametric strategies using Grasshopper. Brienza: Le Penseur, cop. 2014. ISBN 9788895315300.

Complementary:
- Issa, R. AAD_Algorithms-Aided Design. 2014.
- Shell Structures for Architecture: Form Finding and Optimization. London: Routledge, 2014. ISBN 9780415840606.
- McDonough, William. Cradle to cradle = De la cuna a la cuna : rediseñando la forma en que hacemos las cosas. Madrid: North Point, 2005. ISBN 9788448142957.