AR-408

Drawing structures - Docta Manus

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Cursus	Sem.	Type
Architecture	MA1, MA3	Opt.
Civil Engineering	MA1, MA3	Obl.

Language of teaching	English
Credits	4
Withdrawal	Unauthorized
Session	Winter
Semester	Fall
Exam	During the semester
Workload	120h
Weeks	12
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	**30**

Il n'est pas autorisé de se retirer de cette matière après le délai d'inscription.

Summary

The Unit will introduce drawing as the key tool for communication between engineers and architects, and as a mediator between construction and the student. Through drawing, we will analyze selected structural projects that embody an exemplary interaction between space and structure.

Content

Drawing constitutes a very powerful and critical tool of conceptual design. Drawing constructs thought, it acts as a communication interface between the work and the mind and between different disciplines; it is the most powerful language of communication in the working together between architects and engineers.
The UE Drawing Structures will introduce the basic drawing techniques (sketch, plan, section, elevation,axonometry). Based on these techniques, we will further investigate analytical drawing methods capable of exploring structural concepts and their architectural solutions.
Through hand drawing we will analyse selected projects that embody an exemplary interplay of architecture and engineering. Our main focus lies on the load bearing structure and its tectonic and spatial articulation as common intersection between architecture and engineering. Through analysis, students will enter into dialogue with construction in a direct way. They will get a sense for the adequacy of tools and refinements of solutions. We will investigate proportion, material innovation and tectonic articulation in relation to the structural idea and become aware of the importance of detail. Analysis will take apart and make transparent the parameters and dependencies of the design process and will open the work into a condition of possibility.
We will draw by hand, as this is the most direct and immediate way of becoming aware of technique in relation to intention (it forces to take decisions). Drawing by hand is a cognitive process where the dynamic relation between doing and thinking is essential. That is why `the more you draw, the more you see' and vice versa. The construction of points and lines on a sheet of paper will sensitize students to the notions of scale, size, proportion, transparency and composition. The learning hand will build up tacit knowledge.
Each student will analyzed one out of the selected projects, exploring adequate scales, drawing types and techniques to understand the project's structure and construction principles. The drawings thus include dimensioning and fabrication notes up to catalogue of elements, mounting principles and sequence. The careful construction of layers of information by hand builds up into tactile working drawings that embody the spatial and tectonic ideas as well as the construction process of a structure. These 'meta-drawings' allow the observing eye to survey from one detail to another in a synchronous manner while integrating all information into the mental construction.

Keywords

Hand drawing
Structures

Analysis
Tectonics
Tacit Knowledge
Global South

Learning Prerequisites

Required courses

- To understand and master the basic drawing techniques: sketch, plan, section, elevation, axonometry, structural sketch, structural plan.
- To understand the geometric logic of two-dimensional drafting planes and their implications in three-dimensional space;
- To analyse the structural and tectonic logic of a given project by means of an adequate analytical drawing method;
- To understand key structural concepts and their material solutions;
- To develop an understanding of material limits, material innovation and mounting principles;
- To become aware of the enhanced potential of a project designed on the basis of a dialogue between architecture and engineering;
- To develop a coherent argument through drawing.

Learning Outcomes

- Analyze
- Construct
- Compare
- Reconstruct
- Investigate

Transversal skills

- Communicate effectively, being understood, including across different languages and cultures.
- Demonstrate a capacity for creativity.
- Demonstrate the capacity for critical thinking
- Take feedback (critique) and respond in an appropriate manner.

Teaching methods

Ongoing evaluation; students will be evaluated on the basis of the objectives stated in learning outcomes and their engagement (critical thinking, participation, initiative, collaboration).

Expected student activities

ability to work in drawing by hand as construction;
capacity to use analysis as a means of advancing an architectural and structural idea;
collaboration (communication, team work, flexibility within different roles);
engagement (participation, initiative, responsibility)

Assessment methods

Supervision

Office hours	Yes
Assistant.e.s	Yes

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

Barthel, R., Gengnagel, C., & Tomlow, J. (2001). Eladio Dieste: Form und Konstruktion. Verlag Das Beispiel.
Billington, D. P. (1985). The tower and the bridge: The new art of structural engineering. Princeton University Press.
Billington, D. P. (2003). The art of structural design: A Swiss legacy. Yale University Press.
Boudon, P. (1984). Images et imaginaires architecture. Centre Pompidou.
Cruz, F. (2003). Sobre la observación. Escuela de Arquitectura y Diseño PUCV.
Dethier, J. (1984). Images et imaginaires d'architecture: Dessin, peinture, photographie, arts graphiques, théâtre, cinéma en Europe aux XIXe et XXe siècles. Centre National d'Art et de Culture Georges Pompidou.
Farnham, J. E. (1999). Review of Robert Maillart: Builder, designer, and artist. Technology and Culture, 40(1), 154-156.
Figi, H., & Menn, C. (2009). Christian Menn, Brückenbauer (Vol. 3). vdf Hochschulverlag AG.
Gargiani, R., & Bologna, A. (2016). The rhetoric of Pier Luigi Nervi: Concrete and ferrocement forms. EPFL Press.
Greco, C. (2008). Pier Luigi Nervi: Dai primi brevetti al Palazzo delle Esposizioni di Torino 1917-1948. Quart Verlag.
Guaita, P. (2023). Acción y experiencia en la arquitectura: Materia y corporalidad en la enseñanza de la era tecnológica (Doctoral dissertation, Universidad CEU San Pablo). http://hdl.handle.net/10637/14201
Guaita, P., & Baur, R. (2023). Notes on drawing: Interior material lines. In Drawing in architecture education and research.
Instituto Lina Bo e P. M. Bardi (Ed.). (2000). João Filgueiras Lima, Lelé. Editorial Blau.
Lima, J. F. (1980s). Escola Transitória. Unpublished architectural project documentation.
Marti, P., & Maillart, R. (2007). Robert Maillart: Beton-Virtuose. vdf Hochschulverlag AG.
Nervi, P. L., & Desideri, P. (1982). Pier Luigi Nervi. JSTOR.
Pedreschi, R. (2000). The engineer's contribution to contemporary architecture: Eladio Dieste. Thomas Telford Ltd.
Pérez-Gómez, A., & Pelletier, L. (1997). Architectural representation and the perspective hinge. MIT Press.
Rice, P. (2024). An engineer imagines. Batsford Books.
Schön, D. A. (2017). The reflective practitioner: How professionals think in action. Routledge.
Simonnet, C. (2013). Robert Maillart et la pensée constructive. Infolio.
Spiro, A., & Ganzoni, D. (2013). The working drawing: The architect's tool. Park Books.
Universidad de los Andes (Facultad de Arquitectura) & University of Miami School of Architecture. (1987). Eladio Dieste: La estructura cerámica (Colección SomoSur, No. 1). Escala.
Vilela, A. (2017). A casa na obra de João Filgueiras Lima, Lelé. Editora Universidade de Brasília.
Vilela, A. (2018). Architecture without applause: The manufactured work of João Filgueiras Lima, Lelé. ETH Zurich.

Notes/Handbook

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