

- **Course Name**

Introduction to Computational Design and Digital Fabrication in Architecture

- **Course Code**

CAU6168

- **Venue**

CAUP, Building D, Lecture Hall D3

- **Maximum Student Capacity**

30

- **Total Class Hours**

16

- **Credits**

1

- **Teaching Language**

English

- **Semester**

Fall 2026

- **Assessment Means**

Course Reports

- **Brief Introduction of the Course**

This lecture series introduces students to the historical, conceptual, and technological foundations of computational design and robotic fabrication in architecture. It traces the emergence of computation as a transformative force in architectural thinking, from the early development of the computer and its introduction into architectural practice to its appropriation by different avant-garde movements and contemporary design cultures.

The course begins with computational geometry as the basis of digital design, introducing solid and surface modelling, geometric manipulation techniques, and their use in iconic architectural projects. Building on this foundation, it explores parametric design as a rule-based method for establishing relationships between geometric entities. This is discussed not only as a design technique, but also in relation to broader socio-economic shifts from industrial society to a network society.

The series then advances toward generative and performance-based design. Students are introduced to scripting and programming logics such as loops, conditional statements, cellular automata, L-systems, fractals, agent-based systems, and discrete assemblies. These methods are examined through examples from architecture, art, animation and other related fields. Performance-based design extends these approaches by integrating simulation, analysis, evaluation, and evolutionary optimization into the design process.

The final part of the lecture series focuses on digital fabrication and human-machine interaction. It introduces robotic fabrication techniques for brickwork, timber structures, and formative processes, before turning to 3D printing and its relevance for architecture and construction. Historical foundations, patents, maker culture, open-source practices, as well as built examples in concrete, steel, earth, and glass are discussed. The course concludes with virtual and augmented reality,

addressing 3D scanning, computer vision, photogrammetry, and human-in-the-loop strategies for design and fabrication.

● Profile of the Teaching Team

Prof. Dr. Norman Hack is an architect and researcher in the domain of computational architectural design and digital fabrication. He holds a degree in architecture with distinction from Vienna University of Technology and a master's degree with distinction from the Architectural Association in London. After completing his studies, he worked as a coding architect in the Digital Technologies Group at Herzog & de Meuron on projects at various scales and planning stages, from conceptual design to construction planning and from furniture scale to urban design. His interest in integrative digital design and fabrication processes led him to pursue a PhD with Gramazio Kohler Research, which he began at the Singapore-ETH Centre (Future Cities Laboratory) and completed at the National Centre of Competence in Research in Digital Fabrication at ETH Zurich. Among other recognitions, his research has been awarded with the Swiss Technology Award and the ETH Medal for outstanding doctoral theses. From 2018 until 2021 Norman held a tenure track professorship for Digital Building Fabrication at the Institute of Structural Design (ITE) at Technische Universität Braunschweig. At the beginning of 2022 he was appointed full professor in Digital Construction at the same institute. Norman is a member of the executive board of the newly founded Collaborative Research Centre "Additive Manufacturing in Construction" and spokesman of the research area "Design and Construction".

● Course schedule

课程次数	Date	时间	授课老师
1	Oct.15-Thursday	第 1 节课 (08:00-08:45)	袁烽、Norman Hack
2	Oct.15-Thursday	第 2 节课 (08:50-09:35)	袁烽、Norman Hack
3	Oct.15-Thursday	第 3 节课 (10:00-10:45)	袁烽、Norman Hack
4	Oct.15-Thursday	第 4 节课 (10:50-11:35)	袁烽、Norman Hack
5	Oct.16-Friday	第 1 节课 (08:00-08:45)	袁烽、Norman Hack
6	Oct.16-Friday	第 2 节课 (08:50-09:35)	袁烽、Norman Hack
7	Oct.16-Friday	第 3 节课 (10:00-10:45)	袁烽、Norman Hack
8	Oct.16-Friday	第 4 节课 (10:50-11:35)	袁烽、Norman Hack
9	Oct.22-Thursday	第 1 节课 (08:00-08:45)	袁烽、Norman Hack
10	Oct.22-Thursday	第 2 节课 (08:50-09:35)	袁烽、Norman Hack
11	Oct.22-Thursday	第 3 节课 (10:00-10:45)	袁烽、Norman Hack
12	Oct.22-Thursday	第 4 节课 (10:50-11:35)	袁烽、Norman Hack
13	Oct.23-Friday	第 1 节课 (08:00-08:45)	袁烽、Norman Hack
14	Oct.23-Friday	第 2 节课 (08:50-09:35)	袁烽、Norman Hack
15	Oct.23-Friday	第 3 节课 (10:00-10:45)	袁烽、Norman Hack
16	Oct.23-Friday	第 4 节课 (10:50-11:35)	袁烽、Norman Hack