**Module Description   
Computational Design and Fabrication 2**

**Module level:**  
Master

**Language:**  
English

**Module duration:**  
one semester

**Occurrence:**  
Summer Semester

**Credits\*:**  
6

**Total number  
of hours:**  
180

**Self-study  
hours:**  
120

**Contact  
hours:**  
60

\* The number of credits can vary depending on the corresponding SPO version. The valid number is always indicated on the Transcript of Records or the Performance Record.

**Description of achievement and assessment methods:**  
The assessment of students' design capabilities and practical application skills is achieved through a comprehensive design project. In this project, students are expected to leverage a range of computational tools for structural design, shape optimisation, and digital fabrication. Integral to this process is the realisation of physical prototypes within a specialised fabrication workshop, allowing students to translate digital designs into tangible outcomes. The design project is carried out in groups, fostering collaboration and teamwork. Students present their projects in a final 30-minute presentation, highlighting their ability to effectively communicate their work to a broad audience and demonstrate their capacity to analyse various facets of their design. Evaluation of the design project encompasses assessment of each step in the process and the resultant design outcome. The overall grading for the module comprises two components: the design project and fabrication workshop, accounting for 75% of the grade, and the associated final presentation, contributing 25% to the total grade.

**Possibility of re-taking:**  
In the next semester: No  
At the end of the semester: No

**(Recommended) requirements:**  
Programming skills (e.g., in Python) and/or Rhino Grasshopper (software) are required. Successful completion of Computational Design and Fabrication 1 is recommended.

**Contents:**  
The course serves to translate foundational principles of geometric design and computing and apply them within a comprehensive design project, leveraging methods and tools for 3D shape generation, simulation, structural design, and digital fabrication. After familiarisation with selected computational design tools and fabrication technologies, students are expected to carry out an in-depth examination of a domain-specific case study, culminating in a practical design and fabrication task. Through the hands-on application of computational design solutions for advanced fabrication and construction techniques, students will navigate the intersection of various scientific disciplines, including mathematics, computer science, structural engineering, and architecture.

**Study goals:**  
Upon completion of the course, students will be able to:

* implement fundamental versions of algorithms prevalent in architectural geometry, structural design, and digital fabrication,
* utilise mainstream CAD tools as interfaces to self-implemented solutions.
* apply foundational principles of geometric design and computing within a comprehensive design project.
* understand and apply digital fabrication methodologies for tangible physical outcomes,
* understand the scope and relevance of computational methods for architectural design research and practice,
* integrate considerations of sustainability into design-to-fabrication workflows, reflecting on ecological, social, and economic factors.

**Teaching and learning methods:**  
Central to the curriculum are essential themes including structural form-finding, shape optimisation, and the integration of digital fabrication technologies, equipping students with foundational knowledge in addressing design complexities. The hands-on design project reinforces these principles, facilitating practical application and deeper comprehension.

The teaching method is based on the following two pillars:

* Toolchain exploration: Students are introduced to a curated sequence of computational design tools, forming the basis for their application in real-world scenarios. This exploration is supported by guided demonstrations, allowing students to improve their software skills and expand their design exploration capabilities.
* Practical application: The course facilitates a seamless transition from theoretical knowledge to practical implementation. Through the design project, students actively apply the computational tools they have learned to experiment with various design techniques. This phase culminates in the digital fabrication of physical prototypes at multiple scales, which serves to validate and refine design proposals effectively.

**Media formats:**  
Media-supported presentations (PowerPoint, videos, etc.), a programming software platform for computational design and digital manufacturing machines.

**Literature:**  
References will be provided at the beginning of the semester

**Responsible for the module:**  
Dörfler K

**Course Lecturers:**  
D'Acunto P, Dörfler K, Hojjat M, Goldbach A