# UD755 Parametric Urban Design 4(2-2) / 8.0

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**Tuesday, 08:40 - 12:30 Urban Design Studio (R52 B)**

**Course content:**

Development in complexity science flourishing a clear awareness on existence of the emergent systems, which require associative rule-based frameworks to understand and inductive control systems to steer the processes, offers a strong potential to challenge the conventional views on planning and design. In many fields, this motivates designers to conceive the forms and patterns not in terms of its final geometry, but with reference to the form-generating rules and structure. In this context, as a form of generative design method, parametric design suggests very high (controlled) variations via associative algorithms. Having gained a wider area of application in architectural design, parametric modeling has already been a part of research and practical agenda of urbanism in the name of 'parametric urban design'. In this framework, course aims to create a methodological link between computational design and urban design by using the basic tools and techniques of parametric modeling.

As a workshop in parametric urban design, the course aims at providing the students with the computational design thinking and techniques within the specific context of spatial planning and design. UD755 Parametric Urban Design is open for both architecture and planning students having a certain background either on urban or computational design. It also accepts the undergraduate students who are willing to learn parametric design techniques in the context of urban design.

Being open to both the students of planning and those of architecture, the course aims integrate the already established computational design approach in architecture into the context of urban design in MSc-level design research. In this regard, the course sets its main objectives as follow:

- to introduce the planning students with the emerging techniques of computational design (within the specific context of parametric modelling),
- to introduce the students of architecture the basic (morphological) components of urban design (i.e. street pattern, block structure, building setting in collective urban fabric) by using the computational domain of parametric design,
- to provide them with a clear and operational understanding and insight of complexity in urbanism by experimenting the parametric tools to simulate and control urban form within computational domain.

**Course outline:**

**Week 1.** Lecture: 'Parametric (urban) design' -with examples from the workshop organized in May 2014-

**Week 2.** Tutorial: Introduction to Rhino and *Grasshopper*®, the parametric design tool -graphical algorithm editor tightly integrated with Rhino's
Assignment: 3D form generation with *Grasshopper*. –by using the *primitive geometries*-

**Week 3.** Tutorial: Reflection on the assignment of week-2, and introduction *Grasshopper*® continued.
Assignment: 3D form generation with *Grasshopper*. –by using the *primitive geometries*-

**Week 4.** Tutorial: Reflection on the assignment of week-3.
In-class exercise: Introduction to the transformational tool for patterning (i.e. array, mirror, transformational rotation, symmetry, seeding)
Assignment: Making a generic/hypothetical pattern using the basic transformational tools.

**Week 5.** Collective discussion of the assignment of week-4.
Tutorial: Mathematical tools (i.e. series, random) to manage quantitative inputs.
In-class exercise: Revisiting the assignment of week-4 by using the mathematical tools.
Assignment: boundary definition.

**Week 6.** Collective discussion of the assignment of week-5
Tutorial: Mathematical tools (i.e. list, dispatch, set etc. to manage quantitative outputs of a computational algorithm.
In-class exercise: Revisiting the assignment of week-4 by using the new mathematical tools.

**Week 7.** Tutorial: Multiple transformation tools (i.e. attractor, upper-level dispatch)
In-class exercise: Transformation of the 2D pattern in scale and rotation.
Assignment: Refining the in-class exercise pattern.

**Week 8.** Tutorial: 3D operations (i.e. extrude, loft, sweep)
In-class exercise: Generating 3D pattern via attractors and 3D operations.
Assignment.04: Developing a 3D-pattern via one point-attractor and one linear-attractor.

**Week 9.** Tutorial: Boolean operations (i.e. intersection, subtraction, union)

Tutorial: Operations on the components of the 3D objects (i.e. edge, vertex, surface).
In-class exercise: Generating 3D pattern via attractors and 3D operations.
Assignment: Manipulation of the 3D pattern by subtraction, extrusion or tapering.

**Week 10.** Collective/retrospective critiques on the generic patterns produced.

**Week 11.** Introduction of the urban project.

**Week 12-14.** Table critiques on the individual projects.

**Course conduct:**

The course is held in the form of design workshops accompanied by a series of introductory lecture and tutorials, pin-ups and individual/table critiques. Seminars to be made by inviting the instructors from the *MSc in Computational Design And Fabrication Technologies program is also aimed.* The course aims to pursue a more effective process by integrating the students' current final projects in their own (MSc or undergraduate) studios, as much as possible.

**Grading:**

The students will be graded on the basis of the final assignment (50%), individual assignments/homeworks (30%) and attendance to the class (20%). Class attendance, in this context, implies the active participation of the student to the in-class exercises in the whole semester.

**Reference Material:**


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