UNIVERSITÀ DEGLI STUDI FIRENZE
Scuola di Architettura

iCAD

International Course on Architectural Design
Second Level Degree Course

COURSE: ARCHITECTURE STRUCTURAL DESIGN LAB	CLASS: BUILDING SYSTEMS DESIGN – 6 CFU

DIGITAL TECHNOLOGY FOR ARCHITECTURAL FABRICATION

FORM MANUFACTURING

prof. arch. Giuseppe Ridolfi, PhD

SYLLABUS
FALL 2016-17

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D59 — Architecture Structural Design Lab **B020741 – BUILDING SYSTEMS DESIGN**	FORM MANUFACTURING
prof. arch. Giuseppe Ridolfi Phd Email giusepperidolfi@gmail.com Phone: 3357066597	Class Location: room 15, S. Teresa, via della Mattonaia 14 Class Hours: Fri 10:30-17:30 Office Location: room 27, Palazzo Vegni, via s.Niccolò 89/a Office Hours: Thu 10:30-12:30

FORM MANUFACTURING **COURSE OUTLINE**

With «Environmental Design» (second year), this course represents the disciplinary contribution of «Technology of Architecture» to the Master. Both are focused on architectural project and computational parametric design embedding the decisional process, communication and designing as well: processes dealing with willness and facts, with "un-materiality" formalized, computed and extracted through digital technologies.

Course Content. *Form Manufacturing* is the title of the first semester course «Building Systems Design» mainly focused on BIM: the most well known acronym, and representative of digital technologies in AEC. A professional procedure yet required in many countries for public contracts and in many private investment projects.

A new modus operandi, and workflow, that is also catching the attention of other growing services such as facility management and surveying.
What is BIM, how it works, and how we can work with it are the questions the course is addressing focusing on design conception, and management. Design as a research practice based on digital crafting, physical testing and rapid prototyping are also covered

Teaching Language. English

Suggested readings. Bibliography, reading materials, lecture integrations, tutorials to assist assignments and other resources including the Syllabus, the (present) Class Schedule are available online at Mailab.biz. The student is required to access regularly the website to check news and resources update.

Learning Objectives. Upon completion the class, the student is expected to acquire:

- capacity to understand contemporary digital architecture;
- knowledge and skills to conceive and manage construction operational workflows and architectural artifacts under the digital technologies of industrial manufacturing;
- geometrical knowledge and skills to operate in form generation and modeling software;
- confidence with spatial aggregations of a different kind of elements, and structural behaviors
- abilities to manage the designing process combining architectural design, structural engineering, construction technologies, materials and computer fabrication techniques
- basic understanding of the computer-numerically assisted fabrication process and software to feed it
- capacity to produce iterative models to test and to verify architectural hypothesis
- awareness on advanced technologies and new materials suitable for architecture

- abilities to conceive communication strategies and to realize effective public presentations.

Prerequisites. Student attending the class is required to have her/his laptop with preinstalled 3D CAD software, raster/vector graphic programs and any other digital tools for visual communication and public presentations. Plugins and other specific software to support class activities will be available for free downloading during the semester.

Although the class is an introductory teaching on BIM and Computational Design, each student is expected to have confidence in CAD with a basic understanding of solid modeling and to be skilled in graphic design for final and intermediate presentations. Because the class is not providing any teaching about the use of CAD and graphic software and considering that the class proceeds from scratch to advanced modeling techniques, till parametric/generative design in second year, students is strongly recommended to enter short courses on BIM / 3D CAD provided by the «Laboratorio Informatico del Dipartimento di Architettura (LIA)» In addition, students are required to have completed studies on traditional materials and technologies for architectural constructions.

Teaching Methods. The class is a fab-lab conceived as an hybrid computer based hands off/hands on activity, supported by the Department's Architectural Models Laboratory (LMA), and MAILAB – Multimedia Architecture Interaction, reinforced by theoretical dissertations; discussions; and intermediate individual/collective reviews presentations.

Theoretical activities are carried out through teacher's slide presentations integrated by guest lectures, selected readings, case-study analysis.

Other activities are developed through home and in-class assignments concerning the release of a "Construction Prototype Model" for the structural system of the main Lab's Project, and other exercises on natural morphogenesis; physical/digital shape manipulations and generations; manufacturing; case-study analysis; experiments based on transformational methods entailing manipulation of surfaces and/or objects through different procedures and techniques (cutting/stretching, morphing/warping, folding/unfolding, origami/kirigam, waffling, tessellation).

Academic integrity and honesty. The class is against plagiarism and dishonesty. Cheating, appropriation of materials from other authors without crediting them and re-using researches or projects done in previous course without appropriate authorization is a violation of the University's code of academic integrity. Penalties for such violations can result in loss of credits, to fail the course and, in severe cases, to incur legal actions. Students are invited to place clearly source references and credits in appropriate way using standard conventions.

Type of Assessment. Student work evaluation is based on attendance, and credits get during the semester. Class policy establishes that if the student is not attending compulsory classes (see the Class schedule) or has collects more than three absences fails the exam. In any case, the professor is not responsible for students who are not receiving information due to their truancy**.**

Evaluation is expressed on the assignments' results and graded in thirty taking in consideration originality, creativity, refinement, dedication, attention, completeness, correctness:

- 30L- 29 exceptional evaluation, awarded to students whose work is outstanding
- 28-27 distinguished evaluation, awarded to students whose work is good
- 26-24 average evaluation, awarded to students whose work is adequate
- 23-18 low evaluation, awarded to students whose work is sufficient but not completely satisfying in all the aspects
- <18 insufficient, awarded to students whose work failed in several aspects
- NC «not classified», awarded to students whose work is missing or presents severe lacks.

Students failing the course need to start a new course with no credits recognized.

Assignments and Grade. Student work evaluation is based on the following assignments, relative credits and weights:

1	Parametric Cost Estimation	5%
2	Brief for approval > A1 Poster presentation	10%
3	Structural and Technological Model > A1 Folder Review	30%
4	Component Design & Form Manufacturing > Model Prototyping	30%
5	Final Design Delivery and Project Assessment > Final exam	25%

Attendance. This is an occupational class, and attendance is important. Class policy establishes that if the student is not attending classes and has collected more than three absences fails the exam. In any case, the professor is not responsible for students who are not receiving information due to their truancy although most of the information is accessible on line.

Scheduling. In this semester, the «Building Systems Design» class is focused on two topics:

1) the production of the **Building Information Model for a medium small architecture**;
2) the fabrication of a **Conceptual prototype for an architectural building system.**

Here is the related Course Scheduling:

30 Sep. Launching a Project: Concepts, Spaces, and Budgeting
07 Oct. Site Surveying and Place Assessment
14 Oct. Structural Mass Modeling and Environmental Based Computational Morphogenesis
28 Oct. Brief for approval. Concept&Feasibility, Program, 3D Enriched Model of the Site
04 Nov. Design coordination for interoperability
11 Nov. Joining and assembly architectures: structural elements and superstructures
18 Nov. Working with Architectural Bim for structural design
25 Nov. Embedding physical awareness and information extraction
02 Dec. Structural and technological model. Draft deliverables review
16 Dec. Conceptual prototype. Introduction
21 Feb. Conceptual prototype. Researching and Sketching
22 Feb. Conceptual prototype. Modeling and Testing
23 Feb. Conceptual prototype. Prototyping the Model
24 Feb. Final Design Deliver and Project Assessment.

Major topics and Tags. Architectural industrial design, digital design, automated fabrication, BIM, CAD/CAM, digital modeling, folding, interoperability, kirigami, laser cutting, morphogenesis, origami, structural plane plates, tessellation, waffling, zero defects manufacturing.