UNIVERSITÀ DEGLI STUDI FIRENZE
Scuola di Architettura

iCAD

International Course on Architectural Design
Second Level Degree Course

COURSE:	CLASS:
ARCHITECTURE and ENVIRONMENT LAB	ENVIRONMENTAL DESIGN – 6 CFU

Computational Materiality for Sustainable Architectures and Comprehensive Skins

prof. arch. Giuseppe Ridolfi, PhD

SYLLABUS
SPRING 2016-17

B018894 — Architecture and Environment Lab **B018896 — ENVIRONMENTAL DESIGN**	**Computational Materiality for Sustainable Architectures and Comprehensive Skins**
prof. arch. Giuseppe Ridolfi Phd Email giusepperidolfi@gmail.com Phone: 3357066597	Class Location: room 8, S. Teresa, via della Mattonaia 14 Class Hours: Thu 10:30-17:30 Office Location: room 27, Palazzo Vegni, via s.Niccolò 89/a Office Hours: Tue 10:30-12:30

Computational Materiality for Sustainable Architectures and Comprehensive Skins

With «Building System Design» (first year), this course represents the disciplinary contribution of «Technology of Architecture» to the Master. Both are focused on architectural project and computational 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 in order to obtain valuable/reliable architectures.
The philosophy of the two classes is to jump over the software generated free-forms, or the prevalent use of design technology for calculation, visualization, and rendering. Vice versa the goal is pursue a coherent and interoperable process and to promote a research attitude based on digital materiality.

* * *

Course Outline. The course focuses on architectural buildings able to meet human needs while preserving environmental resources. The course teaches a comprehensive design approach concerning decision-making process delivered as a scientific research based on digital modeling in order to materialize physics, alternative solutions and acquire shareable awareness on effects. Since their impact on sustainable effectiveness Massing Optimization in the Early Stage and Building Envelope Prototyping will be explored.

Language: English.

Methodology. Learning is conceived as a scientific research based on computational modeling and as a craftsmanship activity where students are asked to learn and to adapt multiple tools and techniques in order to materialize, test, give evidence of their assumptions and ideas; exchange experiences, and acquire knowledge as well.

Therefore teaching is carried out as a fab-lab developed through in-class design assignments, case-study analysis, and assisted baseline exercises involving use of state of the art architectural modeling, energy simulation/assessment software, and CNC prototyping technology as well.

Activities are also supported by lectures, discussions, intermediate individual/collective reviews presentations, and by the Department's Architectural Models Laboratory (LMA) and MAILAB – Multimedia Architecture Interaction.

Learning Goals. Upon completion the class, students are expected to acquire knowledge, awareness and designing skills on:

- environment as an intra-system between humans, nature and buildings
- performance design, green metrics and energy assessment
- decision-making process based on data evidence
- performance-driven computational work-flow
- architectural mass modeling and numerical simulation of environmental conditions
- high-energy architectural envelopes and passive-energy solutions
- smart technologies and materials for sustainable architectures
- digital prototyping and industrial manufacturing of building envelopes.

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

Prerequisites. Student attending the class is required to have completed Architecture and Structure Design Lab, to have a basic knowledge and skills on BIM and Computational Design, and 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.

More in detail, before the class enters in the lab activities it is strongly recommended to get the educational version of software from Autodesk such as *Revit*, *Insight 360*, *Flow Design*, and from Trimble *SketchUp* and optionally *Sefaira*. *Open Studio* from Alliance for Sustainable Energy, LLC is also mandatory required. Otherwise these software, their installing guides, other free software and plug in will be provided in class. Students that don't have any experience on solid modeling are strongly recommended to get supplementary teaching courses or webinars.

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. For any text and image used, students are required to place clearly source references and credits in appropriate way using standard conventions.

Type of Assessment. Student's work evaluation is based on attendance and credits get during the semester. 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. Evaluation is expressed on the assignments results and graded on thirty taking in consideration originality, creativity, refinement, dedication, attention, completeness, correctness. Below is the grading criteria.

- 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.

Assignments and Grade. Final student grading is based on individual evaluation as a result of different credits and specific weight acquired on the following assignments.

Credit	Assignment	Weight
1	*Conceptual School Building Energy Assessment*	30%
2	*Personal Taccuino for Proposal*	20%
3	*Schematic Proposal for Approval*	20%
4	*Envelope Prototype Manufacturing*	30%

Although grading is based on individual evaluations, students are allowed to develop assignments #3 and #4 in groups not bigger then 3 members. Vice versa assignments #1 and #2 must be carry out individually.

Class Scheduling. Arguments of the class are developed as an integrated contribution inside the «Architecture and Environment Design Lab» course where students are asked to provide a schematic design of a school building in a Mediterranean context.

Inside this frame, the class covers different aspects of Environmental Design in different phases of the project according with the «Architectural Design III» class program and fully integrated with the «Environmental Control Techniques» class activities.

As shown on the next page, the «Environmental Design» program involves a progressive development from conceptual to detailed design where the focus, in the final phase, will be on the architectural envelopes.

Computational Materiality for Sustainable Architectures and Comprehensive Skins

PROGRAM

	PART I	MASSING OPTIMIZATION FOR SUSTAINABLE ARCHITECTURES
02 March	presentation	Course description
	lecture	Computational Materiality and Digital Craftmanships. Performance Design as a Scientific Research
	lab	Tools set up
		Course registration opens
09 March	lecture	Modeling Climate, Weather, Site, and Architectures. Green Metrics and Digital Optioneering in the Early Stage
	assignment presentation	Assignment #01 *Conceptual School Building Energy Assessment*
		Course registration ends
16 March	lab	Digital Optioneering Experimentation in the Early Stage.
21 March	files upload	Assignment #01 *Conceptual School Building Energy Assessment*
23 March	credit discussion	Assignment #01 *Conceptual School Building Energy Assessment*
	PART II	DESIGNING COMPREHENSIVE SKINS	INCEPTION
30 March	lecture	Human Comfort and Architectural Skins. Physical Factors, Conceptual Criteria, and Phsycological Impacts
	assignment presentation	Assignment #02 *Personal taccuino for Proposal*
06 Aprll	lab	Building Envelopes Morphogeneis based on Environmental Parameters. Diagrams, procedures, and manipulations
13 April	lab	Building Envelopes Morphogeneis based on Environmental Parameters. Diagrams, procedures, and manipulations
	EASTER BREAK	
02 May	files upload	Assignment #02 *Personal Taccuino for Proposal*
04 May	credit discussion	Assignment #02 *Personal Taccuino for Proposal*
	PART III	DESIGNING COMPREHENSIVE SKINS	DEVELOPMENT
11 May	lecture	Technological solutions and digital simulations for comphrensive skins
	assignment presentation	Assignment #03 *Schematic proposal for approval*
18 May	lab	Conceptual prototyping for comphrensive skins
25 May	lab	Conceptual prototyping for comphrensive skins
01 June	lab	Conceptual prototyping for comphrensive skins
06 June	files upload	Assignment #03 *Schematic proposal for approval*
08 June	credit discussion	Assignment #03 *Schematic proposal for approval*
	PART IV	DESIGNING COMPREHENSIVE SKINS	PROTOTYPING
	assignment presentation	Assignment #04 *Envelope Prototype Manufacturing*
	CLASS ENDS	
15 June	workshop & reviev	Envelope Prototype Manufacturing
22 June	workshop & reviev	Envelope Prototype Manufacturing
29 June	workshop & reviev	Envelope Prototype Manufacturing
	EXAM	
16 July	files upload	Assignment #04 *Envelope Prototype Manufacturing*
18 July	credit discussion	Final Discussion and Grading