Comprehensive Materiality for Sustainable Architectures and Responsible Envelope

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SYLLABUS

iCAD International Course on Architectural Design
Master Degree Course | 6 CFU

B018894 – Architecture and Environment Lab Class
B018896 – Environmental Design Teaching Module

Comprehensive Materiality for Sustainable Architectures and Responsible Envelopes

With «Building System Design» (first year), this course represents the disciplinary contribution of Technology of Architecture to the Master.

This course is an integrated teaching module of Architecture and Environment Lab Class and it is 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 towards the Environment in its multi-faceted aspects.
The philosophy of this class 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 to pursue a coherent and interoperable process and to promote a research attitude based on evidence of data and materiality.

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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 Mass 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 human as a bio-cultural entitiy, nature, places and buildings
• archetypes and strategies for bioclimatic architectural design
• 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
• technological and feasibility awareness of architectural artifacts, and how to specify them
• industrial manufacturing and digital prototyping 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. Students are required to access regularly the website to check news and update.

Prerequisites. Students attending the class are 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, Rhynoceros from Mc Neel and its plugin Grasshopper, SketchUp from Trimble (optionally Sefaira). Alternatively students can use Open Studio from Alliance for Sustainable Energy that is mandatory required in the Environmental Control Tecniques teaching module. 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.

Assessment and grading. Students' work evaluation is based on attendance and credits got during the semester. Class policy establishes that if students are not attending classes and have collected more than 70% of absences fail 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.

Final student grading is based on individual evaluation as a result of different credits and specific weight acquired on intermediate assignments. Although grading is based on individual evaluations, students are allowed to develop some assignments in small groups whose composition must be agreed with the professor.

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 conceive and to detail an architectural building that will be assigned at the beginning of the semester.

Inside this frame, the class covers different aspects of Environmental Design in different development phases of the project according with the Architectural Design program and fully integrated with the Environmental Control Techniques class activities.
Lectures and assignments involve a progressive knowledge and abilities to assess the site, produce a climate report, identify the most suitable design strategies and detail the solutions for the architectural envelope up to the digital fabrication of a conceptual prototype of a significant part of it.
For the detailed scheduling, check Class Schedule.