UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Architettura
ACADEMIC YEAR	2017/2018
BACHELOR'S DEGREE (BSC)	ARCHITECTURE AND BUILT ENVIRONMENT
SUBJECT	ENVIRONMENTAL DESIGN STUDIO
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	10673-Attività formative affini o integrative
CODE	17424
SCIENTIFIC SECTOR(S)	ICAR/12
HEAD PROFESSOR(S)	SPOSITO CESARE Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	8
INDIVIDUAL STUDY (Hrs)	72
COURSE ACTIVITY (Hrs)	128
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	3
TERM (SEMESTER)	1° semester
ATTENDANCE	Mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**SPOSITO CESARE** Friday 09:30 13:00 Dipartimento di Architettura viale delle Scienze ed.8 - Previo appuntamento via mail

DOCENTE: Prof. CESARE SPOSITO

PREREQUISITES	The prerequisites of the Environmental Design Studio are: the ability to recognize and represent the tangible and intangible features of the built environment, that are significant from the point of view of sustainability of the design solutions. This ability should be already consolidated thanks to the previously attended courses of the degree program. The skills on the following topics are considered especially paramount: the systemic view of the built environment; the performance based approach in building quality; the basic characteristics of materials and construction techniques; basics of environmental engineering and physics and energy performance; the ability to design and adequately represent the components of a building system, verifying the role of materials and construction procedures.
LEARNING OUTCOMES	Knowledge and understanding Necessary methodological tools and skills to understand the environmental problems and systemic relationship between the built environment and its context. Necessary methodological tools and skills to face the environmental problems in the field of architectural design. Applying knowledge and understanding Analytical and critical skills in applying knowledge and understanding to the design activities, aiming at achieve the environmental quality in terms of performance. Making judgments Ability to express independent assessments on the relationship between environmental and built contexts as well as on the design activities, according to objective elements, which include tangible aspects (materials and techniques, distribution solutions) and intangible ones (functions, activities, needs of users), related to the dynamic relationships between the built environment and its context. Communication skills Acquisition of adequate technical terminology to demonstrate application knowledge and skills on the covered topics. Learning skills Attitude to put in a general frame the necessary insights to specific circumstances, demonstrating the ability to update and critically integrate to the needs his own skills.
ASSESSMENT METHODS	The assessment of learning, on a scale of thirty, considers in a final exam, in which can enroll only the students who gain 70% of the obligatory presence. The final exam consists in an oral exam on the topics that will be written in the class register, countersigned by two students at the end of the course, and in a discussion on the graphic elaborations drawn up during the Studio. During the oral exam, the student will be required to draw freehand, if necessary to illustrate specific topics (diagrams and technical solutions). The oral exam aims to verify the acquisition of the skills and the knowledge on the topics of the course program by at least four questions, related to the suggested textbooks and provided teaching materials. In particular, the learning outcomes to be verified are: “Knowledge and understanding”, “Making judgments” and “Communication Skills”. The discussion on graphic elaborations aims to check, in addition to the previous expected results, even the “Applying knowledge and understanding” and “Learning ability” (see “Learning outcomes”). In particular, the following aspects of learning will be specifically evaluated: the capability to correctly connect the addressed issues and to obtain an appropriate synthesis in the developed design solutions; the aptitude to capture design ideas in the specific context (anthropogenic and natural) and to show to possess a set of analytical and testable design methodologies, also in terms of self-assessment. The criteria for defining the assessment thresholds are the following: Excellent: best knowledge of the topics, best properties of language, best analytical ability, the student is able to apply knowledge to solve the proposed problems in an effective way and identify correct and appropriate design solutions; Very good: good mastery of the subjects, full ownership of the language, the student is able to apply the knowledge to adequately solve the proposed problems and identify correct and appropriate design solutions; Good: basic knowledge of the main topics, discrete properties of language, the student is able to apply knowledge to solve the proposed problems and identify design solutions, albeit with some uncertainty; More than sufficient: the student does not have a full command of the main topics of the program but has a certain knowledge, a satisfying property of language, a limited ability to apply his knowledge in problem solving and identifying the design solutions; Sufficient: the student has a minimum basic knowledge of the main topics of the program and technical language, just enough ability to independently apply the acquired knowledge to solve the proposed problems and identify the design solutions;

	Insufficient: the student does not have the minimum acceptable knowledge of the main topics of the program and technical language, he/she has not the ability to apply his/her knowledge to solve the proposed problems and identify the design solutions.
EDUCATIONAL OBJECTIVES	The construction industry includes some of the most energy intensive human activities: each intervention of creation and transformation of the built environment affects the environmental sphere both because involves the direct use of natural resources during the executive phase and because determines the conditions for further use of such resources during the operation phase. Design plays a central role in the definition of architectural quality; therefore, in light of current and future scenarios, it must necessarily deal with the environmental aspects of the site, in compliance with the principles of sustainability, appropriateness and compatibility. The Environmental Design Lab consolidates some fundamental concepts of architecture technology design (systemic view; orientation to quality; variable time; identity of places) and highlights the way these concepts can be materialised into a responsible Architecture, through design choices aware of the environmental values of materials and constructive techniques as well as of distributive and morphological solutions.
TEACHING METHODS	The Environmental Design Studio, whose frequency is mandatory, includes lectures, seminars and exercises. Lectures deal with the topics specified in the program below. Teaching methodology provides for the explanation of illustrated presentations and consequent discussion on the topics. Some special issues consider also follow-up seminars and learning visits. The Studio practice includes the design of a new building or of the recycling of an existing one. The project themes, individually assigned to each student, may provide different uses and scales of intervention, from the district to the building scale. According to an integrated approach, the exercises adopt a multi-scale interpretation of the environmental aspects for the specific site of intervention. The seminars increase the involvement of the students, allowing them to share and treasure each other their case studies.
SUGGESTED BIBLIOGRAPHY	- F. M. Butera Dalla caverna alla casa ecologica, Ed. Ambiente, Milano 2004, ristampa 2014. - F. Conato, V. Frighi, Metodi della progettazione ambientale- Approccio integrato multiscala per la verifica prestazionale del progetto di architettura, FrancoAngeli 2016. - T. Firrone, Prologo alla Progettazione Ambientale, Aracne Editrice, Roma 2016. - M. L. Germana, Architettura responsabile. Gli strumenti della tecnologia, Dario Flaccovio 2005 in corso di aggiornamento e ristampa, scaricabile da https://www.researchgate.net/publication/273144081ArchitetturaresponsabileGlistrumentidellatecnologia - M. Grosso, Il raffrescamento passivo degli edifici, Maggioli, Rimini 1997 (varie ristampe e aggiornamenti). - N. Lechner, HEATING, COOLING, LIGHTING. Sustainable Design Methods for Architects, IV Ed. Wiley 2015. - D. Lloyd Jones, Atlante di Bioarchitettura, UTET, Torino 2002. - A. & C. Sposito, Architettura Sistemica. Materiali ed Elementi Costruttivi, Maggioli, Sant'Arcangelo di Romagna, 2015 Altri riferimenti saranno forniti durante lo svolgimento delle lezioni. Saranno disponibili dispense sintetiche sugli argomenti trattati.

SYLLABUS

Hrs	Frontal teaching
4	I. PREMISES AND GENERAL FRAMEWORK Disciplinary contents and objectives. Activity program. Built environment as influencing factor on the ecological footprint of man, on an individual and collective scale. Role of design, within the building process, the definition of architectural quality and, in particular, the environmental quality. General criteria of sustainability in the process and project. Processes of new construction and on built heritage: distinctions and similarities. Typological and technological evolution of the anthropic settlement and environmental consequences. The fracture of construction continuity, the loss of local identity and the myth of building self-sufficiency. Appropriate technology and links with the construction industry.

SYLLABUS

Hrs	Frontal teaching
8	II. LEARNING FROM THE PAST AND TRADITION. PIONEERING EXPERIENCES AND "FOUNDING FATHERS" OF THE TWENTIETH CENTURY. The unaware sustainability of traditional construction methods and the archetypes of passive house. "Vernacular" habitat and sustainability. The solar house in the US. The Italian architectural culture between World Wars I and II and after World War II in the light of the environmental issue: the pre-existing environment and consolidation of environment. Freak and radical chic experiences in the Sixties and onwards. Hassan Fathy: the update of traditional building techniques and bio-climatic advantages of traditional construction. Victor Olgyay and the "bioclimatic approach": the relationship between buildings, climate and natural elements (water, earth, fire, air). Climate as a determining factor on the technological design of architecture. Paolo Soleri: the holistic approach and utopian charge.
6	III. THE RELATIONSHIP WITH THE SPECIFIC SITE AND ENVIRONMENTAL ANALYSIS The site as a distinctive element of architectural design: complexity of the matters to be considered (mix of natural and man-made elements). Analysis of the winds. Effects of wind on buildings: structures and materials Opening and closure configurations of built environment (at building and urban scale) to the wind (summer and winter strategy). Winds analysis as a basis to analyse and design. Multi-scale analysis: aerodynamic phenomenology and urban structure. Natural light and architectural design (architecture material; factor to be enhanced; factor to be controlled). Effect of solar radiation in the micro-climate: heat island; solar radiation control with the urban green Reflection and absorption of solar radiations by the built environment (albedo index)
6	IV. ELEMENTS OF ENVIRONMENTAL CONTROL AT THE BUILDING SCALE Conformation; aggregation; shape, size and building orientation. Identification and representation of the dominant winds. Ventilation and passive cooling. Ventilation and aeration. Effects of inadequate ventilation on buildings, users and energy costs. The air change inside the building: ventilation and air infiltration (forms of air infiltration). Conflict of needs: thermal insulation vs ventilation. Ventilation systems. Introduction to controlled mechanical ventilation. Elements to be considered for analysing the ventilation: building typology and orientation; openings; roof. Other systems to increase natural ventilation: "Venturi effect"; "Chimney effect" (solar chimney); wind towers. Passive ventilation cooling / Passive evaporative cooling Sanitary importance of natural light. Exposure of the building and distribution system. Location and size of the openings. Solar path and angle of the rays. Solar diagram and its utilization. Introduction to the shading mask. Passive use of solar energy (Passive solar design). Collection systems, storage and distribution. Main types: direct gain; indirect gain; isolated gain (Trombe wall). Passive Solar Cooling (integrations on natural ventilation: wing wall, solar chimney). Solar shielding. Water as an architectural material. Water as a nuisance element, to be removed and controlled: forms of moisture 'in buildings. Rain water management at a urban sector scale: the permeability 'of the external surfaces (BAF or RIE). Introduction to the phytopurification. Water management at building scale (system solutions). Water as a factor for passive cooling. Green as an architecture material at urban and building scale. Benefits and limits. Green roofs and facades.
8	V. ENERGY PERFORMANCE; RENEWABLE ENERGY SOURCES; RECYCLING MATERIALS; ENERGY RETROFIT Energy aspects between a generalist and specialist approach. Energy performance and building envelope. Insulation and "thermal bridges". The EU Directive 31/2010 on buildings energy performance: Energy Performance Building Directive (EPBD). Fields of application; exceptions; (Nearly Zero Building) NZB. Objectives 20/20/20. Energy saving and alternative resources: energy strategies. Renewable Energy Sources (RES) and energy saving (introduction to L. 10/91). Use of energy in buildings. Use of renewable resources in buildings: passive and active systems. Integration of active systems in buildings: advantages. Photovoltaics. The issue of integration in interventions on existing buildings and new constructions. Product innovations: non-conventional photovoltaic modules (DM July 5, 2012). Wind energy. Micro wind and micro-siting. The second life of materials. The construction and demolition waste: criteria for its reduction and management. SRM (secondary raw materials) from C & D and municipal solid waste. Embodied energy, eco-balance and construction. Building retrofitting and energy aspects: the retrofit.

Hrs	Practice
4	Verification of the selected project to be developed in the Studio. The project of recovery or new construction can be proposed by the student or assigned by the teacher, depending on the didactical coordination of the 4th year course.
10	Analysis of the prevailing winds and solar analysis of the site
82	Development and definition of the project