

# Architecture Energy and Ecology

School of Architecture | University of Florida  
ARC 6911 • 03 Credits

Preliminary Fall 2020

In memory of Artist, Architect, and Emeritus Professor Ira Winarsky

*It is not the strongest of the species that survives, nor the most intelligent. It is the one that is the most adaptable to change.*

Charles Robert Darwin, Naturalist

*...architecture is conceivable in its contradictory task only through understanding it as a poetic manifestation; poetic imagery is capable of overcoming contradictions of logic through its polyvalent and synthetic imagery. As Alvar Aalto once wrote: 'In every case [of creative work] one must achieve the simultaneous solution of opposites. Nearly every design task involves tens, often hundreds, sometimes thousands of different contradictory elements, which are forced into a functional harmony only by man's will. This harmony cannot be achieved by any other means than those of art'.*

Juhani Pallasmaa

*There is no reflective ego at one end of the creative process, and no completed and immutable work at the other end. There is instead a poetic force, initially directed by the poet-maker (perhaps at random or guided by his or her life project), but necessarily recreated by the spectator-participant. The poet in love is the only one who is capable of revealing the truth.*

Alberto Pérez-Gómez

## Introduction

Students will explore the relations and interactions among humans and the environments in which they dwell – the metabolic, the natural, and the built. Humans have uniquely harnessed and deployed energy reserves, materials, and natural resource flows to create what James Marston Fitch refers to as the 'Third Environment' – Architecture – interposed between humans and nature. Architecture allowed early humans free themselves from the intensities and stresses of the natural environment – hot, cold, wind, rain. This 'comfort' germinated and nurtured the evolution of a civilized humanity with a highly technical support infrastructure and sophisticated social order. In this evolution of aesthetically driven social culture, Architecture must go far beyond merely moderating environmental stresses. Architecture must also provide an inspiring and evolving typology of specialized cultural activity spaces – home, office, school, store, auditorium, laboratory, hospital bedroom, church, theater, plaza, street, etc. Yet, architecture must still mitigate the environmental stresses, must meet the functional and aspirational requirements of these evolving cultural spaces, and must also be a steward of the limited environmental resources as they are becoming more scarce as the global population grows.

*We shape our buildings; thereafter they shape us.* Winston Churchill

At the onset of the 21<sup>st</sup> Century, scientists clearly understood and have made the case that there are: (1) measurable limits to our environmental resources; (2) significant effects from human action on the environment that are changing it in dramatic ways; and (3) that the impending consequences – warming of earth's atmosphere and/or subsequent sea level rise for example, are real and must be directly addressed. Rather than more 'sustainability' – as was the call for action in the later part of the 20<sup>th</sup> Century – 'resiliency' will guide us in the 21<sup>st</sup> Century. Resiliency, rather than expecting a sustained equilibrium, accepts inherent contradiction, conflict, and change and subsequently embraces challenges as opportunities for cultural advancement and enrichment. What is Architecture's role in the current phase of this evolution? And, how can individuals, as Architects, address and respond to this challenge in meaningful ways? This course will study these issues philosophically, conceptually, and practically, at multiple scales. Regionally, we will

try to understand resources as an ecology (an interrelated system) and energy flow as a cyclical phenomenon. At the scales of site and architecture, we will seek to advance our ability to test and evaluate the interaction of theory and the reality of place and then working back out to the larger scales of ideas and responses. At the scale of the individual, we will seek to understand the relationship between well-being, comfort, and architectural space. Working within and between these scales of thinking, we may gain better insights into humanity in terms of the ecology of resources, architecture, and human well-being.

## **Content**

Research, modeling, thinking, discourse and lectures are the modes of learning that will be employed. We will develop theoretical, conceptual, and practical insights into the relations between the architecture and context – local, regional, and global contexts such as climate, available energy, material resources, and other economic drivers.

Precedent analysis, measurements, drawing and modeling will be conducted toward developing an intuitive knowledge base with regard to energy flows and stores. Precedent research will evaluate noted architectural projects with regard to embodied energy, resource use, and energy efficiency as aspects of both sustainability and design. Students will conduct this research individually and collaboratively and present findings to broaden the discourse and to provide individual insights for seminar discussion.

## **Pedagogical Objectives:**

- Understand human interactions with their environment – physiological (emotive and qualitative properties);
- Understand energy flows, sources, and accessibility;
- Develop an awareness of the various energy sources utilized globally and understand how those sources commonly used in buildings;
- Understand the properties of heat exchange as they relate to thermal comfort and energy use.
- Understand ecology as a system or network of interactions – natural, urban, architectural, human;
- Understand measurement and the applications and limitations of field measurements and computer models.

## **Design Applications:**

- Be able to evaluate precedent projects through drawing, measurement, and analysis;
- Be able to translate precedent concepts and applications into new architectural proposals to achieve an ecologically sensitive design;
- Be able to draw relationships between philosophical ideas of ecologically sensitive living and architectural design proposals.

## **Course Structure**

The seminar course will include organized seminars, topical lectures, student presentation, open discussions and design collaboration time where we will review and critique project proposals. Students will work individually and collaboratively to explore issues through research and design toward a design proposal represented through computer and/or physical scale model studies, simple energy calculations, conceptual diagrams, and product specifications. Students will develop design proposals guided by Leadership in Energy and Environmental Design (LEED) guidelines, individual research, site and program analysis and course critiques. This mode of inquiry and assimilation will carry the projects from conception through concept design drawings while including preliminary material selections, architectural space, programmatic requirements, and energy efficiency.

Field trips locally will be required as part of the course. Active participation in the discourse of the seminar format is critically important – students should come to the course ready to contribute to the discussions.

### Project Sequence

Course pedagogy will be engaged through three typological modes of inquiry. Firstly, we will conduct analytical investigations into the physical and psychological human responses to the natural environment through readings, short lectures, and participatory discourse. Secondly, a noted architectural project that engages sustainability as both an issue of design and a practical response will be selected and deconstructed in an attempt to reveal the linkages between archetypal themes, local climate and ecology, and the subsequent influence of those forces on the creation of space. Thirdly, we will evaluate a range of analytical tools available to estimate and model environmental conditions within architecture. The findings will be prepared as a course dossier and exhibit.

Reading assignments and course discussions will occur on a regular basis. Students are required to read and prepare points of discussion from the readings prior to the class meeting. Participation in the course discussions with regard to the reading material is fundamental to a seminar and is required.

### Student Evaluation (grading)

As a seminar, consistent attendance and active topical contributions by students engenders learning. Enthusiastic engagement in this mode of learning will be rewarded in the final evaluations. Interim reading/discussion assignments will be given that will be included in the participation portion of the student evaluation. One project will comprise the remainder of performance evaluation. Grades will be assigned in accordance with UF grading policies as outlined in the Graduate Catalog and Graduate Student Handbook.

Participation	30%
Project: TBA	70%
<b>Total</b>	<b>100%</b>

### Required Course Texts:

Required readings will be excerpted from a variety of texts and made available in PDF format for the use of students for the purposes of this course. It is suggested that students add the texts from these excerpts to their personal library for further reading and future reference. Distribution of the PDF's beyond the class is not permitted in accordance with US copyright provisions.

### Class Meeting Attendance is required

Day: TBA  
Time: TBA  
Room: Zoom invitation

Due to Covid-19 safe health practices, this course will be conducted electronically.

**Instructor** Martin Gold  
Phone: 352 274-1474  
e-mail: [mgold@ufl.edu](mailto:mgold@ufl.edu)  
Office Hours: by appointment - Zoom

## Electronic Interface

Reference information, articles and other important information for the course can be found at:

[TBA](#)

## Course Schedule

Week	Date	Topics	Prep Reading*
1	Sep 01	<b>Course introduction</b> Architecture and Culture Precedent Project selection	<i>Contribution and Confusion: Architecture and the Influence of Other Fields of Inquiry</i> Juhani Pallasmaa (read before next class)
2	Sep 08	<b>Energy</b> Systems Ecology Model Sources, stores, and access.	A Prosperous Way Down, Howard T. Odum & Elisabeth C. Odum. Chapters 2, 4, and 10. (read in advance).  How Will We Harness Energy?, Biomimicry: Innovation Inspired by Nature, Janine Benyus (read in class)
3	Sep 15	<b>Ecology</b> Climate, Geography, Resources.	Chapter 1, Man Climate & Architecture, B. Givoni. (read in advance) Chapter 9 (pp 257-274) American Building, Fitch  The Art of Architecture in the Age of Ecology, James Wines, Sustainable Architecture Whitepapers. (read in class)
4	Sep 22	<b>Architecture and Precedent</b> Reading and Discussion Case Study Updates	Chapter 9 (pp 275 – 298), American Building, Fitch. (read before class)
5	Sep 29	<b>Case Study discussions</b> Open discussion of project priorities	Chapter 1. Unwarranted Apology, The Architecture of the Well-tempered Environment. Reyner Banham, Second Edition. (in class)
6	Oct 06	<b>Case Study discussions</b> Media presentations by students	No reading
7	Oct 13	<b>Project Assessment and Evaluation</b> Overview, Discussion and mid-term evaluation	Eco Effectiveness, Cradle to Cradle, McDonough & Braungart. (read in class)
8	Oct 20	<b>Thermal Properties</b> Heat Flow and materials – radiation and conduction Field measurement/experiential experiment	Fair and Warmer, American Building and the Environmental Forces that Shape it, Fitch. (read in advance)
9	Oct 27	<b>Psychrometrics &amp; Mechanical Cooling</b> Human Comfort, water-air relationships and cooling systems	Mechanical and Electrical Systems, Tao and Janis, Chapter 2 and Chapter 2 Man Climate & Architecture, B. Givoni (read in advance).  Architectural Graphic Standards, 9 <sup>th</sup> Edition, Ramsey and Sleeper, excerpted (read in advance)
10	Nov 03	Project reviews and discussion	Reading on your own
11	Nov 10	Project reviews and discussion	Reading on your own
12	Nov 17	Project reviews and discussion	Reading on your own
13	Nov 24	<b>Final Project Due</b>	No reading
14	Dec 01	<i>Design Juries - no meeting</i>	
15	Dec 08	<i>Design Juries - no meeting</i>	
16	Dec 15	<i>Final Exams – no meeting</i>	

*\* Readings must be completed in preparation for the discussion on the date they are listed.*  
*\*\* Attendance at all project presentations is required for full credit in the course*

## Academic Integrity

Students must take responsibility for developing their academic and professional integrity, the consequences only increase over time and integrity is a trait that must be nurtured to vital and present. All work submitted in the course shall be the sole work of the author, properly crediting sources and contributors. Claims of authorship or submissions found to be plagiarized in any form will be cause for disciplinary action that could result in failure in the course or sanctioning by the Office of the Dean of Students.

## Course Reference Texts:

The following texts are recommended for further reading:

- A Prosperous Way Down: Principles and Policies, Howard T. Odum & Elisabeth C. Odum, University Press of Colorado, 2001. ISBN: 0-87081-610-1
- American Building: The Environmental Forces That Shape It, James Marston Fitch with William Bobenhausen, Oxford University Press, 1999. ISBN: 0-19-511040-4
- Biomimicry: Innovation Inspired by Nature, Janine M. Benyus, Perennial, 2002. ISBN: 0-688-16099-9
- Cradle to Cradle: Remaking the Way We Make Things, William McDonough & Michael Braungart, North Point Press 2002, ISBN: 0-86547-587-3
- Combinatory urbanism: The Complex Behavior of Collective Form, Morphosis on Urban Planning, edited by Stephen Rigolot, Stray Dog Café, 2011. ISBN: 10-0983076308
- Eco Urbanism - Sustainable Human Settlements: 60 Case Studies, Miguel Ruano, editor, GG, Barcelona, 1999.
- Getting Smarter About Smart Cities, Torner, A., & Puentes R., Brookings Institute, April, 2014.
- Green Cities of Europe, Edited by Timothy Beatly, Island Press, 2012. ISBN: 978-1-59726-d975-9
- Grey World – Green Heart: Technology, Nature, and the Sustainable Landscape, Robert Thayer, Jr., John Wiley and Sons, Inc. 1994. ISBN: 0-471-57273-X
- From Eco-Cities to Living Machines: Principles of Ecological Design, Nancy Jack Todd and John Todd, North Atlantic Books, 1993. ISBN: 1-55643-150-3
- Man Climate & Architecture, B. Givoni, Van Nostrand Reinhold, 1969, ISBN: 0-442-26296-5
- Natural Capitalism: Creating the Next Industrial Revolution, Hawken, Lovings, Lovings, Little Brown and Company, 1999. ISBN: 0-316-35316-7
- Sustainable Architecture White Papers, Earth Pledge Foundation, 2000. ISBN: 0-9675099-1-2
- The Nature of Economies, Jane Jacobs, Vintage Books, 2000. ISBN: 0-375-70243-1
- The Architecture of the Well-tempered Environment, Reyner Banham, University of Chicago Press, 1984. ISBN: 0-226-03697-9
- Who's Your City?, Richard Florida, Basic Books, 2008. ISBN: 0-465-00352-4