Architecture Energy and Ecology

ARC 6680 • 03 Credits Spring 2026
School of Architecture | University of Florida

Class Meeting: Tuesdays 3:00 pm - 6:00 pm (periods 8-10)
Room: Zoom Meeting
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Office Hours: Wednesdays 9:30 am or by appointment

Course Summary: Engaging design challenges that rely on theoretical, conceptual, and practical analytical inquiry toward viable architecture proposals that positively responsive to ecology, energy, and resource systems.

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 [wo]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, sensory, natural, and the built. Humanity has uniquely harnessed and deployed energy reserves, invented materials, manifested technology, and drawn from 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 to free themselves from the intensities and stresses of the natural environment – hot, cold, wind, rain. This initial 'comfort' germinated and nurtured the evolution of a civilized humanity with highly complex technical support infrastructures and sophisticated social order. In this evolution of an 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, garden, street, city, etc. Yet, architecture must still mitigate environmental stresses and must also meet the ever increasing functional and aspirational requirements of these evolving cultural spaces. Architects, as the creators of these realms, must be stewards of the limited environmental resources available on our planet while housing the global population growth, urban density, industrialization, and perhaps for now, a shrinking land mass.

> *We shape our buildings; and afterwards our buildings shape us.*
>
> Winston Churchill

At the onset of the 21st Century, scientists clearly understood and have made the case that there

are: (1) measurable limits to our environmental resources; (2) human actions within the environment are changing our planet in dramatic ways; and (3) that the impending consequences – warming of earths atmosphere and/or subsequent sea level rise for example, are real and must be directly addressed. Rather than seeking more 'sustainability' – as was the call for action in the later part of the 20th Century – 'resiliency' will guide us in the 21st Century. Resiliency accepts and perhaps even embraces change. Rather than expecting a sustained equilibrium resiliency accepts the inherent contradiction, conflict, and dynamic nature of our planet's systems and subsequently embraces these challenges as opportunities for more enriched dwelling, cultural advancement, and a healthier natural environment.

What is Architecture's role in this current phase of human evolution? And, how can individuals, as Architects, address and respond to these challenges 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 experience of place and to then work 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, we may gain better insights into humanity in terms of the ecologies of: resources, urbanism, architecture, and human well-being.

Content

Research, drawing, modeling, thinking, designing, writing, 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 deployed toward nurturing an intuitive knowledge base and conceptual understanding of energy flows and stores as they relate to architecture and community 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, physical, sensory, 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 human comfort and energy use, and the potential for passive design;
- Understand ecologies as systems or networks 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 and discuss issues through research

and design toward a design proposal represented through drawings and computer model studies. Simple energy calculations, materials properties, conceptual diagrams, and product specifications will be conducted to measure viability proposed designs. Students will develop design proposals guided by Leadership in Energy and Environmental Design (LEED) guidelines. Individual research, site and program analysis and course critiques will also guide design decisions. 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.

Active participation in the discourse of the seminar format is critically important – students should engage the course positively by contributing to the discussions.

Project Sequence

Florida's population is expected to grow by 15 million people by 2070—approximately 341,000 new people per year for the next 45 years. To meet this demand for housing, it will require: (1) substantial infill development densifying existing urban areas; (2) additional walkable and transit-oriented communities; and (3) more resource efficient suburban neighborhoods. In each case, there is a role for well-considered design to advance resilient and ecologically sensitive residential communities in one of Florida's many regional contexts (urban, coastal, rural, suburban). Key course issues will be to optimize urban the infrastructure in place; increase residential density; optimize the use of land/resources; enhance diverse community experiences; and provide a community that is resilient with regard to natural disasters, economic downturns, and climate change.

Project 1: Select a Florida region of interest and research that context in terms of energy flows, water resources, utilities, transit connectivity, and land-uses, residential densities, and cultural character. Identify a potential site for project 2 that will include residential redevelopment. The Project 1 assignment will be provided including detailed requirements and process steps.

Project 2: Develop a conceptual proposal for a neighborhood design (vertical or horizontal). Specifically, we will be looking at a singular development proposal that will connect to the local context, energy and resource flows—sun, water, recycling—and suggest a model for other future development in the area. Natural, passive, and active thermal control strategies will be investigated as opportunities for architectural integration. Community spaces and productive use of adjacent landscape will be required. A Project 2 assignment will be provided with detailed requirements and process steps.

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. Reading assignments and course discussions will occur on a regular basis—reading in advance and prepared points for discussion are required. ***Participation in the course discussions will require students to have read the material. Students are expected to make at 3 points each from the readings during discussion.***

Electronic Interface

Reference information, articles and other important information for the course can be found on the course Canvas site in the "files" link on the menu bar.

Academic Commitment

Students are required to attend all class meetings and scheduled outside field trips (to be arranged with student input). Students are expected to come to class on time prepared to discuss, in the seminar forum, the course readings. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at: https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Academic Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester. Contact the Disability Resource Center at: (352-392-8565, www.dso.ufl.edu/drc/).

Course Schedule

Week	Date	Topics	Prep Reading*
1	1/13	**Course introduction** Architecture and Culture **Project 1 Introduction**	Be sure to start reading the assignments in advance of our next meetings.
2	1/20	**Energy** Systems Ecology Model Sources, stores, and access.	01 Harnesing Energy, Chapter 3. Biomimicry, Janine Benyus. (read in advance) 02 A Prosperous Way Down, Chapter 4: The Ways of Energy, Odum. (read in advance).
3	1/27	**Ecology** Climate, Geography, Resources. Case Study Updates (short presentations)	03 Recovering Landscape as a Critical Practice, Introduction from Recovering Landscape, James Corner.
4	2/03	**Region Site Study Presentations Due** Due in Class	No reading due
5	2/10	*No Class Meeting*	Gold on NYC Trip with D6
6	2/17	**Architecture and Precedent** Reading and Discussion Case study questions discussion	04 American Building, Chapter 9: Integration and Climate (pp 257-274), Fitch. (read in advance)
7	2/24	**Project 2 Assignment and Discussion**	05 Sustainable Architecture Whitepapers, The Art of Architecture in the Age of Ecology, James Wines. (read in advance)
8	3/03	**Life Cycle Theory and resource cycling**	06 Cradle to Cradle, Eco Effectiveness, McDonough & Braungart. (read in advance)
9	3/10	**Thermal Properties & Psychrometrics** Heat Flow and materials – radiation and conduction Estimating and modeling heat flow.	07 American Building, Chapter 3: Fair and Warmer, Fitch. (read in advance)
10	3/17	*No Class Meeting*	Spring Break
11	3/24	**Mechanical Cooling** Human Comfort, water-air relationships, and cooling systems, district cooling, heat sinks.	08 The Architecture of the Well-tempered Environment, Chapter 1. Unwarranted Apology. Reyner Banham, Second Edition. (read in advance) 09 Architectural Graphic Standards, 9th Edition, Ramsey and Sleeper, excerpted (read in advance)
12	3/31	Project reviews and discussion	Reading in class – TBA
13	4/07	**Final Presentations Due**	In class presentations for feedback.
14	4/28	**Tuesday – Final Submissions Due (submission to MIRO Board)**	With revisions from presentation comments for final grading.

** 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 and Honesty

Students must take responsibility for developing there academic and professional integrity, the pressure and consequences of poor decisions in this regard typically increase over time. Integrity is a nurtured skill that must regularly be exercised. All work submitted in the course shall be the sole work of the author with properly crediting sources and collaborators. Claims of authorship or submissions found to be plagiarized in any form will be referred to the Dean of Students and may be cause for disciplinary action that could result in failure in the course or suspension from the University. Please refer to the UF Student Honor Code: https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/

UF students are bound by The Honor Pledge which states:

> *We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment."*

The Honor Code specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor.

Student Evaluation – Attendance, Expectations, Make-up

As a graduate seminar, consistent attendance and active topical contributions by students is required as part of the learning process. Enthusiastic engagement in the seminar and discussion mode of learning will be rewarded in the final evaluations. Interim reading/discussion assignments will be given and will count toward the participation portion of the student evaluation.
It is unfortunately not possible to make up for missing a seminar discussion. Since that is a fundamental basis for the course, more than two (2) unexcused absences may result in failure in the course. There are no quizzes or exams. Late submissions will have a 10% penalty when evaluated. Two projects will comprise the remainder of the performance evaluation. Grades will be assigned in accordance with UF grading policies: https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/#gradestext

Participation	15%
Project 1: Ecology and Study	35%
Project 2: Design Proposal	50%
Total	**100%**

The grading scale below outlines the qualitative assessment that will be used to evaluate student performance in this course. The depth and breadth of discussion contribution, analysis work, and your design proposals require a relative and subjective interpretation. The evaluation and grade will be based on the quality of work produced based on the levels of achievement outlined below:

Qualitative Calibration of Grade Scale:

A	Outstanding work only (far exceeds minimum requirements)
A-	
B+	
B	Good work (above average – quality work that exceeds minimum requirements)
B-	
C+	
C	Average work (just meets minimum requirements)
C-	
D+	
D	Poor work (does not meet minimum requirements)
D-	
E	Inadequate or incomplete work

Numeric Grading Scale (UF standard):

Percent	Grade	Grade Points
93.0 - 100.0	A	4.00
90.0 - 92.9	A-	3.67
87.0 - 89.9	B+	3.33
83.0 – 86.9	B	3.00
80.0 - 82.9	B-	2.67
77.0 - 79.9	C+	2.33
73.0 – 76.9	C	2.00
70.0 - 72.9	C-	1.67
67.0 - 69.9	D+	1.33
63.0 - 66.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

Course Evaluation by Students

Feedback from students is critical toward continued improvement in course content and delivery. Students are highly encouraged to use the anonymity of the evaluation process to freely express concerns and suggestions for improvement. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/

UF Academic Policies and Resources

For additional UF "Academic Policies & Resources," go to: https://go.ufl.edu/syllabuspolicies.

These resources include information about:

- Requirements for class attendance, make-up exams, and assignments
- Processes for students with disabilities who may require accommodations
- Current UF grading policies
- Expectations for course evaluations and constructive feedback
- The University's Honesty Policy regarding cheating, plagiarism, etc.
- In-class recording of class lectures for personal use
- Academic resources, including contact information
- Campus health and wellness resources, including contact information

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 Bobenhousen, Oxford University Press, 1999. ISBN: 0-19-511040-4
- Architectural Graphic Standards (12th Edition), Ramsey/Sleeper, Wiley, 2016, ISBN-10: 9781118909508, ISBN-13: 978-1118909508, ASIN: 111890950X
- 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, Tormer, 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

- Recovering Landscape, James Corner, editor, Princton University Press, 1999. ISBN 1-5689-179-1
- Sun, Wind & Light, Second Edition, G. Z. Brown and Mark Dekay, John Wiley & Sons, Inc., 2001, ISBN 0-471-34877-5
- 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