Abstract: The course engages the contemporary issues of urban ecology and its articulation to design in urban settings. The new commitment of the co-habitation of nature and built environment has drawn attentions of city planners, urban designers and architects. The discourses of urban sustainability have to move away from social sufficiency, ecological efficiency to systems compatibility by linking the urban forms and ecological flows in urban, industrial and natural systems. The climate challenges require design and planning professionals to deal with how cities could be analyzed, designed, managed, evaluated, represented and changed to meet the goals of shaping ecological, sustainable and resilient urban future. Defined by two categories Forms and Flows, the course covers theories, methods, tools and case studies of ecologically sound urban systems design. The first session Theory and Method introduces foundational theories in urban design, urban ecology, ecological design, and engages contemporary debates in urban sustainability and ecological urbanism. The second session Forms: Landscape and Urban Structure deals with landscape ecological structure, ecological effects of mega cities, sustainable urban form, waterfront revitalization, the debates of landscape urbanism, downtown urban environment and the proposition of organized complexity in cities. The third session Flows: Urban Metabolism covers theories and issues that address the concept of urban metabolism: how energy, material, water, informational flows and human movement in cities are structured and designed. The course concludes with a synthesis of design method for ecological urban systems, in which urban design is seen as an ecological intervention and modeling tools for synthesizing complex system issues. Students are expected to participate in lecture series, tutorials and seminars actively. The course this year has a special focus on smart city design. By selecting one specific theme under the course framework, students will participate in research teamwork and work on individual term paper over the semester.

Course Schedule

PART I: Theory and Method
1. 1/13 Introduction: Urban design, urban ecology and ecological design
2. 1/20 Urban sustainability, ecological urbanism and smart city movement
Ecological city-regions in global context

PART II: Forms: Landscape and Urban Structure
3. 1/27 Landscape ecological flow: design for ecologically sound landscape patterns
4. 2/03 Urban-nature edges and landscape urbanism
Global waterfront design and redevelopment
5. 2/10 Downtown urban environment and organized complexity

PART III: Flows: Urban Metabolism
6. 2/17 Energy flow and urban form (Steven Quan)
7. 2/24 Informational flow: Urban modeling and Geodesign (with Steven Quan)
8. 3/03 Seminar: 1) density and urban form; 2) energy, urban form and design
9. 3/10 Seminar: 3) water-energy-food nexus in urban design; 4) eco city performance metrics
10. 3/17 Urban ecosystems (Marc Weissburg)
11. 3/24 Spring Break
12. 3/31 Design for urban metabolism (dialogue with Marc Weissburg)
13. 4/07 Students’ project presentation (1)
14. 4/14 Students’ project presentation (2)
15. 4/21 A synthesis: urban systems design for smart cities

Learning objectives
Students will be exposed to the following theories, methods and tools:
- Theories of urban design, urban ecology and ecological design;
- A literature review of contemporary debates on urban sustainability, ecological urbanism and smart city movement;
- Landscape ecology and planning;
- Industrial ecology, life cycle assessment and energy performance of urban systems;
- Foundation in urban hydrology;
- Basic computing tools for urban design and performance-based urban modeling.

Learning outcomes
Students who successfully complete this class will be able
- To be familiar with recent literature of urban design, urban ecology and ecological design;
- To develop a research design for the performance measure of urban form;
- To co-work in a small research focus group based on one of special topics that students select from the syllabus and to make a group presentation for the project;
- To learn how to apply urban simulation tools to problems such as energy performance and visual quality assessment of urban environment;
- To complete a research term paper under the guidance of the instructor.

The semester aims for developing a resource book on Smart City Design with contributions from student participants through group research projects and term papers. Students will pick up one specific topic related to Smart City Design based on a framework defined by the course.

Criteria of Performance Evaluation
1. 20% class attendance and seminar participation
2. 20% weekly reading notes
3. 20% project presentation (group project)
4. 40% term paper (The submission requirements of the reading and term papers are described in the following session.)

Submission Requirements
1. The weekly readings are divided by required and recommended categories. Before attending the class, students are required to complete the required reading, which is carefully selected from the whole reading list. The recommended reading is mainly for the long-term interests as well as a source for the research project and individual term paper.
2. Research project is a group project, to be presented by power point or other suitable ways of presentation. The grouping and topics for individual group are to be determined by 1/25.
3. The following submission are required for all students:
   1) Readings: one-page (max) reading note (for weekly sessions 2, 3, 4, 5, 6, 7, 10, 12 only) is to be submitted to the course folder under “Reading notes”, 9am Friday of the week before the class begins.
   2) Seminar: each student will select at least one reading from the seminar lists (summarize and present it in the class. The seminar reading summary, in the form or WORD or POWERPOINT is to be submitted to the course folder under “Seminar”, 6pm before the seminar session.)
   3) 1/27, the first draft proposal, up to 2 pages;
   4) 2/24, the second draft of the term paper, 4-6 pages;
   5) 4/14, research project (POWERPOINT format)
In general, the following guidelines apply to this course:

1. Engage yourself in class activities so you can maximize your learning. Before coming to the class, please read all required materials and be prepared for discussion. Class participation grades will reflect your participation in these activities, not just your attendance.

2. If events prevent you from attending a class, please let me know in advance by e-mail.

3. Please follow the due date on your problem sets or assignments. Late work will not be accepted unless emergent events happen.

4. Academic honor code and student code of conduct:
   All students should be knowledgeable of the Georgia Institute of Technology Academic Honor Code. The Georgia Tech Academic Honor Code (http://www.catalog.gatech.edu/rules/18b.php) and Student Code of Conduct (http://www.catalog.gatech.edu/rules/19b.php) outline the Institute’s expectations for the integrity of students’ academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading these two documents fully and for living up to them. Among the Codes’ provisions are expectations about unauthorized access, unauthorized collaboration, plagiarism, false claims of performance, grade alteration, falsification, forgery and distortion. You should be absolutely clear in indicating when you have used ideas or words that are not your own. You are permitted to discuss the written assignments in this course with your fellow classmates, but, except for group assignments, you should not collaborate on your submissions.

5. Students with disabilities:
   Students with disabilities needing academic accommodation should provide documentation to the Access Disabled Assistance Program for Tech Students (http://www.adapts.gatech.edu/) and bring an ADAPTS accommodation letter to the instructor indicating the nature of accommodations required. This should be done within the first week of class or as soon as possible after a new disability condition arises. All effort will be made to provide reasonable accommodation.

Reading List

1. Urban Design, Urban Ecology and Ecological Design
   (required)

   (recommended)

6) 4/28, 12PM (TBA), final term paper (5000 words max for graduate students and 4000 words max for undergraduate students)


2-1. Urban Sustainability, Ecological Urbanism and Smart City Movement

(required)

- President’s Council of Advisors on Science and Technology, 2016, *Report To The President: Technology and the Future of Cities*, Source: PCAST, [www.whitehouse.gov/ostp/pcast](http://www.whitehouse.gov/ostp/pcast).


(recommended)


2-2. Ecological city-regions in global contexts

(required)


(recommended)


- Burdett R, Sudjic D, eds. 2007, the part ‘Cities’ in *The Endless City: The Urban Age Project by the London School of Economics and Deutsche Bank’s Alfred Herrhausen Society*, Phaidon Press Ltd.


3. Landscape ecological flow: design for ecologically sound landscape patterns
(required)

(recommended)

4. Urban-nature edges and landscape urbanism; Global Waterfront design and redevelopment
(required)
• Yang Perry P J, 2013, Landscape ecology and its urbanism, in Landscape Urbanism and its Discontents: Dissimulating the Sustainable City, Andres Duany and Emily Talen eds., Island Press.

(recommended)
5. Downtown urban environment and organized complexity
(required)

(recommended)
• Appleyard D, 1976, Planning a Pluralist City: Conflicting Realities in Ciudad Guayana, MIT Press.
• Cherry N, Nagle K, 2009?, Grid/Street/Place: Essential Elements of Sustainable Urban Districts, American Planning Association.
• Lynch K, 1972, What Time Is This Place, MIT Press.
• Lynch K, 1972, Managing the Sense of a Region, MIT Press.

6. Energy flows and urban forms
(required)

(recommended)


7. Informational flow: Urban modeling and Geodesign
(required)


(recommended)


8. Seminar: 1) density and urban form; 2) energy, urban form and design
(required)

1) density and urban form


2) energy, urban form and design


9. Seminar: 3) water-energy-food nexus in urban design; 4) eco city performance metrics

(required)

3) Water-energy-food nexus in urban design


4) eco city performance metrics


(recommended)


10. Urban ecosystems

(required)


[recommended]

11. Spring break

12. Design for urban metabolism
   (required)

[recommended]
• Kennedy C, Pincetl S, Bunje P, 2010, The study of urban metabolism and its applications to urban planning and design, in Environmental Pollution 1-9.

13. Students’ project presentation (1)

14. Students’ project presentation (2)

15. A synthesis: urban systems design for smart cities
   (required)

(recommended)
• Honda, S. ed. 2014, Mn’M Workbook 3: Future Urban Intensities. Flick Studio, Tokyo