ARCH 519: Sustainability in the Environment
Infrastructures, Urban Landscapes, and Buildings
Elective, interdisciplinary course (3 units)

Methodologies and exercises on contextual design and environmentally sound technologies (ESTs), applications for the sustainability of urban infrastructures, operative landscapes, and building integration in the urban system.

Introduction and Purposes
The seminar is an interdisciplinary forum for dealing with contemporary issues facing urban environments such as; increasing density, land use, resource efficiency, CO₂ emissions reduction, ecosystem restoration, climate adaptation / resiliency, food deserts, environmental quality (indoor and outdoor), public health / environmental justice, mobility, and the economic viability of sustainability alternatives.

Working with established and emerging environmental management frameworks, this course aims to explore and apply practical (and measurable) approaches to address urban sustainability challenges at the street, neighborhood, district, and municipal scale with a focus on regions within the greater Los Angeles area as laboratories for investigation. The course identifies where action might be taken to transform existing infrastructures, landscapes and buildings to meet sustainability performance goals established by the city of Los Angeles, the State of CA, and our own class.

Seminar Structure
The course is designed with an emphasis on self-directed collaborative research and direct interaction with the urban environment and city institutions. Learning will be supported by interactive lectures, guest speakers, workshops, web-based resources and site visits. The lectures provide the conceptual framework for the course and will be supplemented with assigned readings, exercises, and field-based research and evaluation. Students are required to complete all the assigned readings on time, prior to the class meeting where they are listed. Students may be asked to prepare a half-page response to each week’s readings, which will be collected at the beginning of class.
Course Website
Updated information on the seminar is available on the course management web site (blackboard).

Field Trips
Throughout the semester we will attempt to visit several sites to conduct field research. I will do my best to announce and schedule these fieldtrips to fit your schedule during the week and provide you as much time as possible to make the necessary arrangements.

Assignments and Grading
The total grade for this course will be based on class participation, class assignments, a mid-term presentation, field trips (TBD) with a written summary report, and the final project report.

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>Class Participation</td>
</tr>
<tr>
<td>30%</td>
<td>Class Assignments and Weekly Reading Responses</td>
</tr>
<tr>
<td>10%</td>
<td>Midterm Presentation</td>
</tr>
<tr>
<td>20%</td>
<td>Final Project Presentation</td>
</tr>
<tr>
<td>15%</td>
<td>Final Project Report Draft</td>
</tr>
<tr>
<td>15%</td>
<td>Final Project Report (complete)</td>
</tr>
</tbody>
</table>

Final Project
The purpose of the final project is to provide students with an opportunity to apply course knowledge to real world problems facing the sustainability of the greater Los Angeles area. The assignment will emphasize collaboration, effective problem formulation, practical application of course material/techniques, and effective communication of project outcomes. For the final project, students will work in small groups (3 to 4). Each group will define a unique district-scale boundary within the greater Los Angeles area and work to produce a 2050 Sustainable Urban Development Action Plan (SUDAP). The objective of each SUDAP is to effectively transform existing infrastructure and building stock to meet a set of measurable sustainability performance indicators established by the group. Work will involve assessment of current energy and mass flows, identification of future requirements (e.g. growth, urban climate, demographic change), establishment of performance targets, case study evaluation, application of environmentally responsive technologies, and identification of potential barriers (e.g. economic, social, behavioral), and leverage points for effective action (e.g. economic incentives, policy tools, citizen engagement, demonstration projects, deep-energy retrofits, etc.). Groups will work collaboratively to coordinate and link district-scale actions to reinforce broad objectives at the municipal scale (e.g. urban heat island mitigation, bicycle and pedestrian networks, ecological corridors, pollution management). Each group will be responsible for producing and presenting an action plan and a report concisely documenting research and analysis supporting project outcomes. Additional information about the nature and scope of the project will be provided over the course.
**Week 1 (August 30)**
Definitions, Concepts, and Course Overview

Key topics: The important role of cities in global sustainability (e.g. C40 Cities), defining urban sustainability, ecological urbanism and a brief history of approaches. Review of the course scope, course outline, and seminar approach, learning objectives, CA research agenda, final group project.

Required reading (to be completed prior to class)

1. UNEP, 2007. Livable Cities: The benefits of urban environmental planning. (Read full doc, identify key problems and risks facing cities)
   http://www.unep.org/urban_environment/PDFs/LiveableCities.pdf

2. California Vulnerability and Adaptation Study (CA Institute for Energy & Envir., CIEE)
   http://uc-ciec.org/climate-change/california-vulnerability-and-adaptation-study

   http://crec.berkeley.edu/research.html

Reference (review and make note of these references)

1. UN Conference on Environment and Development, 1992. (Earth Summit, Agenda 21, origins of the UNEP)

2. UN Agenda 21, 1992. (Emphasis on Environmentally Sound Technologies)

   http://www.un-documents.net/wced-ocf.htm

   www.mcdonough.com/principles.pdf
Week 2 (September 6)
Problems, Measures, Benchmarks

Key topics: Framing of environmental sustainability problems, approaches to measurement and benchmarking, (energy use intensity, “net-zero”, CO₂ footprint, ecological footprint, IPAT, resource flows), models for examining urban metabolism, C40 Cities.

Required reading


Reference


2. Saul Griffith, 2011. Climate change recalculated (Watch all videos: ~1.5 hours)
   http://fora.tv/2009/01/16/Saul_Griffith_Climate_Change_Recalculated

3. Architecture 2030 website
   http://www.architecture2030.org/

Case Studies

1. Copenhagen, Denmark. A carbon neutral capital?

2. Helsinki, Finland

3. Los Angeles

4. Seattle Climate Action Plan
   http://www.seattle.gov/archive/climate/
Week 3 (September 13)
Frameworks for Action

Topics: Urban Environmental Management Systems (EMSs), urban and neighborhood-scale sustainable development frameworks, performance targets, CA and LA initiatives / long term plans.

Sustainable development is a context-driven concept; different societies tend to define it based on their own values, needs and expectations.

Required reading

1. Portland Sustainability Institute (PoSI): Ecodistrict Assessment Methods (Download from course website) (79 pages).

Reference

4. Seattle Architecture 2030 district http://www.2030district.org/seattle/about

Case Studies

1. UC Merced Campus (Triple-Zero) http://ppdc.ucmerced.edu/sustainability-and-environment/triple-net-zero-commitment
**Week 4 (September 20)**
Land Use and Urban Form

Topics: Regional planning, sprawl, edge cities, transit/pedestrian-oriented development, smart growth, adaptive reuse, creative housing, urban growth boundaries, planning livable environments, (inter)national case-studies, PARK-ing day.

Required reading

1. Green Urbanism, Chapters 2 and 3, (80 pages).


Reference


2. Densities for public transit (DU / acre) [http://www.sierraclub.org/sprawl/articles/characteristics.asp](http://www.sierraclub.org/sprawl/articles/characteristics.asp)


5. LEED for Neighborhood Development.

6. Compass Blueprint (SoCal) [http://www.compassblueprint.org/](http://www.compassblueprint.org/)

Case Studies

1. Freiburg, Germany, the Vauban district (A 5,000 resident district on the site of a former French military barracks) [http://www.vauban.de/info/abstract4.html](http://www.vauban.de/info/abstract4.html)

2. Portland Oregon (transit oriented development, EcoDistricts)


5. LA Dept. of City Planning. Urban Design Principles (draft) [http://urbandesignla.com/udprinciples.htm](http://urbandesignla.com/udprinciples.htm)

Week 5 (September 27)
Urban Mobility

Topics: Alternative forms of transit, planning transit and development in tandem, bicycle / pedestrian networks, bus rapid transit (BRT), tactical urbanism (short term action, long term change), transit energy intensity.

Required reading

1. Green Urbanism, Chapters 4,5,6 (88 pages).
   [http://www.driversofchange.com/slimcity/](http://www.driversofchange.com/slimcity/)

Reference

1. ICLEI: Ecomobility (e.g. “Megacities on the Move”, “Car free development”) 
3. Transportation for America [http://t4america.org/](http://t4america.org/)
4. Cycling Embassy of Denmark 
5. Housing and transit (H+T) affordability index [http://htaindex.cnt.org/](http://htaindex.cnt.org/)
7. bikeportland.org

Case Studies

   [http://www.cyclecopenhagen.dk/cc/master.php](http://www.cyclecopenhagen.dk/cc/master.php)
2. Bogota TransMilenio Bus Rapid Transit (BRT) 
3. City Mayors : Mexico City, Plan Verde 
4. Portland, OR TriMet (and Streetcars) 
   [http://trimet.org/index.htm](http://trimet.org/index.htm)  
5. Los Angeles TOD case study (see related links, e.g. MITOD.org)
   http://latod.reconnectingamerica.org/welcome

6. Downtown Los Angeles Neighborhood Council (Complete Streets)
   http://www.dlanc.com/completestreets/

7. Vauban District, Germany (suburbs without cars)
Week 6 (October 4)
Urban Landscape and Climate

Keywords: City-scale climate adaptation planning, bio-climatic design, urban heat island, surface material properties, cool roofs, cool pavements, cool cars, outdoor comfort, urban cooling strategies, link between buildings and urban climate.

Required reading

   http://www.chicagoclimateaction.org/pages/adaptation/11.php

   http://sage-ereference.com.libproxy.usc.edu/view/greencities/n82.xml?result=84&q=


References

1. UCLA Energy Design Tools: Climate Consultant
   http://www.energy-design-tools.aud.ucla.edu/

2. Stone, Brian, 2012. The City and the Coming Climate: Climate Change in the Places We Live.


4. Lawrence Berkeley National Laboratory, Urban Heat Island Group
   http://heatisland.lbl.gov/


Case Studies

1. Chicago, NY, LA, Phoenix
**Week 7** (October 11)

**Sustainable Buildings**

Topics: Energy efficiency standards / targets, net-zero, indoor environmental quality, passive strategies and link to urban scale factors (air quality, noise, climate, solar exposure), green building rating systems

**Required reading**

   [http://www.driversofchange.com/slimcity/](http://www.driversofchange.com/slimcity/)

2. NREL Research Support Facility. The Road to Net Zero (52 pages).


**Reference**

1. Rocky Mountain Institute (RMI)
   [http://www.rmi.org/Buildings](http://www.rmi.org/Buildings)

2. CPUC, The California Efficiency Strategic Plan (Sep 2008) (Net zero by 2020, 2030)

3. DOE Building Energy Data book

   [www.nrel.gov/docs/fy08osti/41957.pdf](http://www.nrel.gov/docs/fy08osti/41957.pdf)

5. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standard 189.1 : Standard for the Design of High-Performance Green Buildings (Peer-review draft available on course website)


   [https://ilbi.org/lbc/standard](https://ilbi.org/lbc/standard)

8. California Energy Efficiency Standards (Title 24)
   [http://www.energy.ca.gov/title24/](http://www.energy.ca.gov/title24/)

**Week 8 (October 18)**

**Smart Energy and Water**

Topics: Review and case-study application of Environmentally Sound Technologies (ESTs), energy and water linkages, best practices for net-zero water, best practices for water management, energy storage (UC Merced).

**Required**

   [http://www.driversofchange.com/slimcity/](http://www.driversofchange.com/slimcity/)


**Reference**


   (Available online from USC library)

   [http://cascadiagbc.org/resources/cleanwaterhealthysound.pdf](http://cascadiagbc.org/resources/cleanwaterhealthysound.pdf)


   [www.pacinst.org/reports/greywater_overview/greywater_overview.pdf](http://www.pacinst.org/reports/greywater_overview/greywater_overview.pdf)

**Case Studies**

1. UC Merced Campus (Triple-Zero)

2. ARUP UrbanLife: Water Resilience for Cities

3. My Power Berkeley (smart energy)
   [http://mypower.berkeley.edu/](http://mypower.berkeley.edu/)
**Week 9 (October 25)**

Ecological Infrastructure

Topics: Ecosystem services, landscape as living system, urban food supply/security, green corridors / ways / belts, ecological restoration, brownfields, greyfields, de-sealing, recreation and public health, urban wilderness, wetlands

Required

1. Green Urbanism, Ch. 7. Urban ecology and strategies for greening the urban environment (26 pages).

2. Wolch et al., 2010. Childhood obesity and proximity to urban parks and recreational resources: A longitudinal cohort study. Health Place.  


References


2. The Urban Wildlands Group  


4. Fossil fuels and industrial farming  

5. World Health Organization (WHO). Ecosystems and Human Health  
   [www.who.int/entity/globalchange/ecosystems/ecosys.pdf](http://www.who.int/entity/globalchange/ecosystems/ecosys.pdf)

Case Studies

1. Shanghai Houtan Park  
   (Landscape as living system)  

2. South Bronx Greenway (Majora Carter Group)  

3. The High Line  
   (Adaptive reuse of rail infrastructure for recreation and pedestrian transit)  
   [http://www.thehighline.org/galleries/images](http://www.thehighline.org/galleries/images)
Week 10 (November 1)
The Renewable City

Topics: Renewable energy systems, solar resource analysis (e.g. Berlin’s solar atlas), solar access and building / urban configuration, building integrated solar (passive thermal heating, photovoltaic systems, daylighting systems, solar thermal collectors), solar envelope, solar shading analysis, building solar exposure and energy use

Required reading


References

1. National Renewable Energy Laboratory (NREL) PV Watts tool (Determines the energy production and cost savings of grid-connected photovoltaic (PV) energy systems) [http://www.nrel.gov/rredc/pvwatts/]

2. David MacKay, Sustainable energy without the hot air (Section on application of solar) [http://www.inference.phy.cam.ac.uk/withouthotair/c6/page_38.shtml]


Case Studies

1. [http://megacities.usc.edu/research/solar-cities/example-cities.htm]

2. SMUD, Premier Gardens Zero Energy Solar Homes (Sacramento, CA)

3. Examples from Germany (Karlsruhe)
Week 11 (November 8)
Urban Longevity

Topics: Embodied energy, life cycle assessment, adaptive reuse, flexibility / resilience, future-proofing, urban infill, design for disassembly, life-cycle of building systems (layers of shear), carbon payback period, data sources for existing building stock (CBECS).

Required reading


Reference

1. AB 1103 Commercial Building Energy Use Disclosure Program
   http://www.energy.ca.gov/ab1103/


7. Build Carbon Neutral (for estimating embodied carbon)
   http://buildcarbonneutral.org/

8. Design for Reuse Calculators
   http://www.publicarchitecture.org/reuse/index.php/resources/

9. 3. Bath University ‘Inventory of Carbon & Energy’ (ICE) database
   http://www.bath.ac.uk/research/features/embodiedenergy.html

Case Studies
1. Cross-laminated timber (multi-story) buildings

2. Brewery Blocks (Portland, OR), adaptive reuse

3. Ghirardelli Square (San Francisco, CA)

4. Empire State Building Retrofit

5. NBI database
   http://newbuildings.org/advanced-design/getting-50-beyond
Week 12 (November 15)
Costing Green, Making the Business Case for Sustainability Actions

Topics: Natural capital, total life cycle cost analysis (LCCA), comparing technology and retrofit options based on simple (and discounted) payback period, average cost effectiveness, evaluating the economic benefits of green buildings, case studies of incentive systems for retrofits and renewables.

Required

1. Lovins, A. Tunneling Through the Cost Barrier.

Reference

1. Gary Pivo, Univ. of Arizona (Responsible Property Investing)
4. Nils Kok  
   http://www.nilskok.com/
6. U.S. Department of Commerce Triple-bottom-line tool  
   http://www.commerce.gov/blog/2012/08/30/new-innovative-online-tool-help-weigh-benefits-economic-development-projects-using-
   http://www.wbdg.org/resources/lcca.php
**Week 13** (November 22)
University holiday, no class

**Week 14** (November 29)
Class final project presentations (25 min. each)

**Week 15** (December 6)
Field trip: Led by Travis Longcore, Ph.D, Urban Wildlands group.

First stop:
Leo Politi Elementary
2481 West 11th Street
Los Angeles, CA 90006

Second stop:
Daylighted stream park (small one).
3498 W 2nd St
Los Angeles, CA 90004

**Week 16** (December 13)
Final project report due: Thursday, December 13, 11 a.m.-1 p.m.¹

¹ [http://www.usc.edu/academics/classes/term_20123/finals.html](http://www.usc.edu/academics/classes/term_20123/finals.html)
Statement for Students with Disabilities
Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to my TA) as early in the semester as possible. DPS is located in STU 301 and is open 8:30AM-5PM, Monday through Friday. The phone number for DSP is (213) 740-0776.

Statement on Academic Integrity
USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one’s own academic work from misuse by others as well as to avoid using another’s work as one’s own. All students are expected to understand and abide by these principles. Scampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A:

http://www.usc.edu/dept/publications/SCAMPUS/gov/

Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at:

http://www.usc.edu/student-affairs/SJACS/

Attendance and Late Work
Attending classes is a basic responsibility of every USC student who is enrolled in courses at the School of Architecture. Although any student should be evaluated primarily on their demonstrated knowledge through project development, papers, quizzes, and exams, the School believes important skills such as verbal presentation, design discussion and articulation of critical issues within each course are equal additional measures of demonstrated knowledge, particularly for our professional degree programs.

More than two unexcused absences may result in a failing grade. More than two instances of unexcused tardiness will be counted as an absence. Work turned in late will not be accepted.

Any student not in class within the first 10 minutes is considered tardy, and any student absent (in any form including sleep, technological distraction, or by leaving mid class for a long bathroom/water break) for more than 1/3 of the class time can be considered fully absent. If arriving late, a student must be respectful of a class in session and do everything possible to minimize the disruption caused by a late arrival. It is always the student’s responsibility to seek means (if possible) to make up work missed due to absences, not the instructor’s, although such recourse is not always an option due to the nature of the material covered.