University of Southern California School of Architecture

ARCH 540L TOPICS IN MEDIA FOR LANDSCAPE ARCHITECTURE
Exploration of emerging techniques for landscape architecture study, presentation, and documentation.

Grasshopper for Landscape Architecture: Resilient Surfaces
Landscape Architecture 540L, 2 units
Spring 2014 Semester

Instructor: Alexander Robinson, Assistant Professor
Location: Spatial Sciences Computer Lab
AHF B455 - Basement of Hancock Foundation Building
(Enter the Hancock Foundation Building from Trousdale Parkway, go down the righthand hallway and down the stairs to the basement level. The Spatial Sciences department is at the end of the hallway. The receptionist can help you find the lab.

Time: Friday, 9-12PM
Contact: alexander.robinson@usc.edu
USC Office & Hours: Harris 3rd Floor, Office Hours on Appointment
Introduction

To a larger extent than landscape theorists are perhaps comfortable, a substantial portion of the material practice of landscape architecture remains focused on the morphology and surface treatment of topographies. While the idea of surface has expanded beyond the deceiving discrete moment of ground exposure, the profession remains obsessed with the treatment of this moment. This is in many ways understandable: the surface moment of ground is where landscape treatments engage with both a diverse set of dynamic forces and ecologies as well our complex of perceptions and predominant experiences.

Perhaps unsurprisingly two of the most significant and definitive material engagements in typical landscape architecture design practice cling to this epidermal moment: planting and paving. The first, the signature material system of landscape architecture, recognizes the opportunity in terms of resources for a surface to support living ecologies. The second, acknowledging the fragility of this condition and intensity of urban flows, reinforces or armors the surface condition to maintain stability. The performance of both (both materially and culturally), in the face of unrelenting, high-output urban ecologies, to a large extent determines the value of our profession and practice and is of critical importance to our success.

With each of these systems there are three primary considerations that explicitly (or not) drive their material design: aesthetic / experiential intent, material logic / design, and resilience / engagement with dynamic urban ecologies. In very general terms, while we always intuit the last of these, the first two considerations dominate the design process. Aesthetic / experiential intent is a heavy focus for good design and material logic and design is the established means to achieve this effect via practiced systems of visual, often non-dynamic, representations. However, the engagement of the dynamic set of forces and ecologies that drive both the genesis and long-term performance of landscape interventions in the design process often remain fuzzy and the least rigorous part of the process.
In this class, we will explore how landscape surface treatments can better respond to and explore the complex physical and ecological conditions that should equally if not more determine their composition as other concerns. By doing so we will understand how surfaces become resilient in the face of multiple forces and considerations. Rhino with Grasshopper will enable us to create a dynamic feedback loop between complex custom analysis and the composition of surface treatments (and landscape topographies to some extent). Through the dynamic visualization / representation of histories / associations we can control and adjust more fluidly and achieve closer adjustments to dynamic conditions.

In addition to a variety of smaller skill based exercises, the class will have two primary assignments:

**Performance Planting Analysis & Plan**
This will focus on the development of high-performance plant suitability map and dynamic planting plan that will reveal hidden forces and ecologies. This assignment will result in a set of drawings that are both instructive and aesthetic. The topography base for this plan will be the students selection.

**Resilient Surfaces**
The final assignment will results in at least one material surface treatment that is responsive to both topographic conditions and dynamic performance factors. You will likely be required to prototype this system in a model.

**Class Methodology**
All classes will meet in the computer lab. **Students may use the lab computers, but it is highly recommended that students bring their own computers with Rhino V5 and newest version of grasshopper loaded.** The lab computers will have Rhino V5 and hopefully all required plugins. If students plan on using the lab computers, please bring a flash drive or portable hard drive to work off of.

Most classes will entail a live demonstration on the computer, followed by some lab time for students to practice the methodology and/or discuss and troubleshoot outstanding issues.

There will be regular assignments, generally submitted in the form of drawings online with two larger assignments that will be presented to the class and/or jury.

**Pre-Requisite Knowledge**
Students are recommended to have at least a minimum familiarity with the Rhino modeling environment. Some students have taken the class without having prior instruction in Rhino, but this is only recommended for students who are confident in their ability to learn basic operations in new software. While necessary to run Grasshopper, in this class Rhino is primarily utilized as an "interface" for Grasshopper. Rendering will not be taught.
Please let me know if you have concerns. We can discuss.

**Software**

**Rhino V5** is available on the lab computers and for purchase with an educational discount. NOTE: Rhino V5 Beta for the Mac OSX is available for free, but Grasshopper does not run on the Mac!

**Grasshopper** is free and is available on lab computers, but only works in Windows. There is an extensive online community with many helpful answers and resources. [http://www.grasshopper3d.com/](http://www.grasshopper3d.com/)

*Recommended Grasshopper Plugins:*

MeshEdit  
[http://www.food4rhino.com/project/meshedittools](http://www.food4rhino.com/project/meshedittools)

WeaverBird  

Human  
[http://www.food4rhino.com/project/human](http://www.food4rhino.com/project/human)

AutoLandscape  

gHowl (optional)  
[http://www.grasshopper3d.com/group/ghowl](http://www.grasshopper3d.com/group/ghowl)

Kangaroo (optional)  
[http://www.grasshopper3d.com/group/kangaroo](http://www.grasshopper3d.com/group/kangaroo)

**Bibliography and Resources**

**Rhino 3D**

Central Location for Tutorials  
[http://www.rhino3d.com/tutorials.htm](http://www.rhino3d.com/tutorials.htm)

Rhino 4: Rhino 4 Manual and Training  
[http://download.rhino3d.com/Rhino/4.0/Rhino4Training/](http://download.rhino3d.com/Rhino/4.0/Rhino4Training/)

Rhino Video Tutorials  
[http://www.infiniteskills.com/training/rhino-4-essential-training.html](http://www.infiniteskills.com/training/rhino-4-essential-training.html)

**Grasshopper**

Tutorial & Manuals  
[http://www.grasshopper3d.com/page/tutorials-1](http://www.grasshopper3d.com/page/tutorials-1)

Plethora Project (by USC’s own Jose Sanchez)  
[http://www.plethora-project.com/education/2012/02/05/rhino-grasshopper/](http://www.plethora-project.com/education/2012/02/05/rhino-grasshopper/)

Primary Tutorial  
(may not be available)

Most questions have been asked and answered online in the user groups. You will likely need to find help here at some point.  
[http://www.grasshopper3d.com](http://www.grasshopper3d.com)
Assignments & Grading
Assignments will be assigned after each exercise and are due, unless otherwise stated at the beginning of the next class. Two late assignments will be accepted, though they must be turned in within a week of the due date. There will be a final assignment and no exams or quizzes.
10% Participation and Attendance
30% Class Assignments
30% Performance Planting Analysis & Plan
30% Resilient Surfaces

Course Schedule
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<tr>
<th>Week</th>
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<td>1/17</td>
<td>Intro to Grasshopper (&amp; Rhino)</td>
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<td>2</td>
<td>1/24</td>
<td>Intro to Grasshopper II</td>
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<td>3</td>
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<td>Meshes &amp; Analysis I</td>
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<td>Meshes &amp; Analysis II</td>
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<td>5</td>
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<td>Planting Plan &amp; Analysis I</td>
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<td>7</td>
<td>2/28</td>
<td>Workshop Day / Misc. Topics</td>
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<td>8</td>
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<td>Surface Treatments I</td>
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<tr>
<td>9</td>
<td>3/14</td>
<td>Surface Treatments II</td>
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<td>X</td>
<td>3/21</td>
<td>SPRING BREAK!</td>
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<td>10</td>
<td>3/28</td>
<td>Surface Treatments III</td>
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<td>Workshop Day / Misc. Topics</td>
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Attendance Policy
The School of Architecture’s general attendance policy is to allow a student to miss the equivalent of one week of class sessions (three classes if the course meets three times/week, etc.) without directly affecting the student’s grade and ability to complete the course. If additional absences are required for a personal illness/family emergency, pre-approved academic reason/religious observance, the situation should be discussed and evaluated with the faculty member and appropriate Chair on a case-by-case basis. For each absence over that allowed number, the student’s letter grade will be lowered 1/3 of a letter grade (e.g., A to A–).

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 break) for more than 1/3 of the class time can be considered fully absent. If arriving late, a student must be
responsible 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.

Being absent on the day a project, quiz, paper or exam is due can lead to an “F” for that project, quiz, paper or exam or portfolio (unless the faculty concedes the reason is due to an excusable absence for personal illness/family emergency/religious observance). A mid term or final review is to be treated the same as a final exam as outlined and expected by the University.

See full attendance statement at: http://arch.usc.edu/People/SchoolGovernanceDocuments

**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 TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 A.M.–5:00 P.M., 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/. The USC summary of how to avoid plagiarism: http://www.usc.edu/student-affairs/student-conduct/ug_plag.htm and specific advice for grad students: http://www.usc.edu/student-affairs/student-conduct/grad_ai.htm may also be useful.

**Accreditation**
The Master of Landscape Architecture degree program includes three curricula. Curriculum +3 for students with no prior design education and Curriculum +2 for students admitted with advanced standing have full accreditation by the Landscape Architecture Accreditation Board. Curriculum +1.5 for students with advanced placement is a post-professional study and is not subject to accreditation. Information about landscape architecture education and accreditation in the United States may be found on-line at http://www.asla.org/Education.aspx.