ARCH 417 Computer Programming in Architecture
Units: 3
Fall 2023—Mondays—6:30-9:00pm

Location: WAH B1
https://maps.usc.edu/?id=1928&reference=WAH#lm/552474

Zoom:
https://usc.zoom.us/j/95151204393?pwd=YjluV1JTTWhZGZiWXdqUFFHM3VkJUT09

Instructor: Sarah Hammond
Office Hours: by appointment
Contact Info: skhammon@usc.edu

Course Description
This course provides a foundation into computer programming as well as an understanding of how to analyze and manipulate data in both Python and C#. The course looks at data structures and studies algorithms as it applies to architecture and design. We will utilize Rhino3D, Grasshopper, and Microsoft Visual Studio to explore procedural techniques, then move toward Object-Oriented programming (OOP) in computation.

Learning Objectives
Student will:
- Read and write basic syntax of the Python programming language.
- Read and write the basic syntax of the C# programming language.
- Generate a simple program by writing, testing, and debugging code.
- Process data using sequential input and output files.
- Recognize the use of data structures.
- Utilize Rhinoscriptsyntax and Rhinocommon and reference existing libraries.
- Integrate C# in Visual Studio for Grasshopper to create custom components.
- Explore optimization techniques.
- Manipulate imagery.
- Implement an existing algorithm into code.

Recommended Preparation: Familiarity with Rhino3D and Grasshopper is advised.

Course Notes
Students will have weekly labs and two projects (midterm and final). Time will be allotted each class for students to work on the labs and to ask questions. Students will have the option to integrate their midterm and final assignments into their studio projects.
Class will be divided into the following parts:
1. Lab Review (if assigned)
2. Lecture + Precedent
3. Tutorial
4. Workshop
Technological Proficiency and Hardware/Software Required
Students should bring their laptop and mouse to class. The following software is required:
Rhino3D + Grasshopper
Microsoft Visual Studio 2019 Community

Required Readings and Supplementary Materials
Supplementary Recourses:
C# Guide: https://docs.microsoft.com/en-us/dotnet/csharp/

Assessment of Assignments
Grading rubrics to be provided with each lab and project.

Grading Breakdown

<table>
<thead>
<tr>
<th>Assessment Tool (assignments)</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labs (8)</td>
<td>40</td>
</tr>
<tr>
<td>Midterm Project</td>
<td>25</td>
</tr>
<tr>
<td>Final Project</td>
<td>25</td>
</tr>
<tr>
<td>Participation</td>
<td>10</td>
</tr>
</tbody>
</table>

TOTAL 100

Grading Scale
Course final grades will be determined using the following scale:
A 95-100
A- 90-94
B+ 87-89
B 83-86
B- 80-82
C+ 77-79
C 73-76
C- 70-72
D+ 67-69
D 63-66
D- 60-62
F 59 and below

Assignment Submission Policy
When assigned, labs will be due Thursdays at 11:59pm.

Grading Timeline
Labs submitted on time will be graded before the following class.

Additional Policies
Late labs will have 1 point deducted from the final score each day past the due date. Labs must be submitted before the following class session when the answers will be reviewed. If not received by then, students will receive a 0.
Academic Integrity
The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university’s mission to educate students through a broad array of first-rank academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the USC Student Handbook. All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or “recycle” work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the student handbook or the Office of Academic Integrity’s website, and university policies on Research and Scholarship Misconduct.

Course Content Distribution and Synchronous Session Recordings Policies
USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment.

Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. (Living our Unifying Values: The USC Student Handbook, page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the internet, or via any other media. (Living our Unifying Values: The USC Student Handbook, page 13).
# Course Schedule: A Weekly Breakdown

*Subject to change throughout the semester*

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Lab</th>
<th>Lab Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8.21 / Introduction to Programming in Architecture / Introduction to Python (Data Types, Expressions, Operations)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>8.28 / Introduction to Visual Studio / Comments, Strings, Lists, Branching</td>
<td>Lab 1</td>
<td>8.31</td>
</tr>
<tr>
<td>3</td>
<td>9.4 / Labor Day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>9.11 / Lab 1 Review / Branching continued</td>
<td>Lab 3</td>
<td>9.14</td>
</tr>
<tr>
<td>5</td>
<td>9.18 / Lab 2 Review / While, For Loops</td>
<td>Lab 4</td>
<td>9.21</td>
</tr>
<tr>
<td>6</td>
<td>9.25 / Lab 3 Review / Functions / Grasshopper Libraries</td>
<td>Lab 5</td>
<td>9.27</td>
</tr>
<tr>
<td>7</td>
<td>10.2 / Lab 4 Review / File Processing (Read/Write) / GIS Datasets</td>
<td>Lab 6</td>
<td>10.5</td>
</tr>
<tr>
<td>8</td>
<td>10.9 / Lab 5 Review / Introduction to C# / Introduction to OOP (Inheritance, Polymorphism)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>10.16 / Lab 6 Review / Branching, Loops, File Processing in C# / Grasshopper Libraries / Midterm Check-In (Identify Parameters)</td>
<td>Lab 7</td>
<td>10.26</td>
</tr>
<tr>
<td>10</td>
<td>10.23 / MIDTERM Project Review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>10.30 / Image Manipulation + Colorization / Mesh Optimization using Kangaroo + Weaverbird / Animation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>11.6 / Lab 7 Share / Optimization using Galapagos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>11.13 / Introduction to Visual Algorithms / Guest Lecturer</td>
<td>Lab 8</td>
<td>11.16</td>
</tr>
<tr>
<td>14</td>
<td>11.20 / Designing with Algorithms (Perlin Noise, Fields, Fractals, Shortest Paths) / Houdini FX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>11.27 / Designing with Algorithms II / Packaging Custom Components</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12.11 / FINAL Project Review</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Statement on Academic Conduct and Support Systems

Academic Integrity:
The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, compromises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university’s mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or “recycle” work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the student handbook or the Office of Academic Integrity’s website, and university policies on Research and Scholarship Misconduct.

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:
USC welcomes students with disabilities into all of the University’s educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:
Counseling and Mental Health - (213) 740-9355 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

988 Suicide and Crisis Lifeline - 988 for both calls and text messages – 24/7 on call
The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.
**Relationship and Sexual Violence Prevention Services (RSVP)** - (213) 740-9355(WELL) – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

**Office for Equity, Equal Opportunity, and Title IX (EEO-TIX)** - (213) 740-5086
Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

**Reporting Incidents of Bias or Harassment** - (213) 740-5086 or (213) 821-8298
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

**The Office of Student Accessibility Services (OSAS)** - (213) 740-0776
OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

**USC Campus Support and Intervention** - (213) 740-0411
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

**Diversity, Equity and Inclusion** - (213) 740-2101
Information on events, programs and training, the Provost’s Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

**USC Emergency** - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

**USC Department of Public Safety** - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call
Non-emergency assistance or information.

**Office of the Ombuds** - (213) 821-9556 (UPC) / (323-442-0382 (HSC)
A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

**Occupational Therapy Faculty Practice** - (323) 442-2850 or otfp@med.usc.edu
Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.