School of Architecture

Undergraduate Syllabus
ARCH 4702 – Design Scripting

Course Number:	ARCH 4702
Course Title:	Design Scripting
Instructor:	Matthew Swarts matthew.swarts@coa.gatech.edu
Credit Value:	3 credit hours
Course times:	Th 6:05pm-8:55pm
Location:	Architecture West 358
Website:	http://designscripting.gatech.edu/fall2014

Catalogue Description:
Learning the concepts and application of scripting languages in architecture and form generation.

Objectives:
The computer has become a manifest tool for nearly all phases of the design process. “But lo! [We] have become the tools of [our] tools.” – Walden (1854). To overcome our tools, we must re-learn how to create them for ourselves. The purpose of this course is provide an introduction to computational methods of representing and evaluating spatial configurations, perceptions, and experiences through the use of computer scripting languages.

The primary language for this course will be Python for which basic syntax and structure will be covered as needed. This course presumes no prior knowledge in computer science; however additional time for practice is expected. We will also use Autodesk’s Dynamo, a graphical scripting language, to produce geometric visualization and analysis when appropriate. This course is supplementary to Parametric Modeling, Design Space Construction, and Design Space Exploration.

Course Objectives:
Students will be able to:
- create and execute a python script in an Integrated Development Environment
- collapse a multi node graphical script into a python script
- create and iterate through basic data structures, such as lists
- read, write, and parse through image and text data files
- import external libraries and integrate them into a script

Learning Outcomes:
Students should be able to:
- recognize when a problem will benefit from automation
- recognize when a computational approach is appropriate
- know the different among multiple computational models
- express a design problem through a computational model

Course Format:
The class will meet once a week for lectures, activities, tutorials, and in-class assignments. Short video based lectures, script assignments, and basic web-based script learning assignments will be required before each class. A log of weekly assignment outputs will be posted to a class website. A midterm exam will be used to assess basic scripting skills. A final project and presentation on a spatial design challenge will evaluate working knowledge of the techniques taught in the course.

Course Schedule:

Week	Date	Topic
1.1	8/21/2014	Course Introduction
1.2		Dynamo Introduction
1.2		Python Introduction
2.1	8/28/2014	Variables, Methods, Libraries
2.2		Geometry Basics
2.3		Loops and Parametric Curves
3.1	9/4/2014	NURBS Geometry
3.2		Arrays, Lists, Trees, Graphs
3.3		Grids and Tiling
4.1	9/11/2014	Subdivision, Recursion
4.2		2D Fractals
4.3		3D Fractals
5.1	9/18/2014	Shape Grammars
5.2		L-Systems
5.3		L-Systems
6.1	9/25/2014	Particle Systems
6.2		Agent-Based Simulation
6.3		Agent-Based Simulation
7.1	10/2/2014	Collision Detection
7.2		Diffusion Limited Aggregation
7.3		Circle Packing
8.1	10/9/2014	**Midterm**
8.2		Elementary Cellular Automata
8.3		Elementary Cellular Automata
9.1	10/16/2014	Game of Life
9.2	(Fall Break Tues)	Bitmaps, Color
9.3		3D Cellular Automata

10.1	10/23/2014	Graphs
10.2		Graph Theory
10.3		Graph Theory
11.1	10/30/2014	Graph Traversal
11.2		Shortest Path
11.3		Neural Networks
12.1	11/6/2014	Physical Simulation
12.2		Triangulated Mesh
12.3		Mesh Relaxation
13.1	11/13/2014	Isovist Analysis
13.2		Occlusion, Enclosure, Sky View Factor
13.3		Viewsheds
14.1	11/20/2014	Aesthetic Measures
14.2		Aesthetic Measures
14.3		Multi Dimensional Scaling
15.1	11/27/2014	**Thanksgiving Break**
15.2		
15.3		
16.1	12/4/2014	**Dead Week**
16.2		
16.3		
12/8/2014-12/12/2014		**Spatial Experience Project Presentation**

General Responsibilities and Expectations:
Attendance:
Students are expected to attend and participate during each class session. Attendance for all scheduled exams or any in class presentation is required. If you know that you will miss a class, please advise your instructor at least 24 hours in advance. If an unexpected situation occurs, it is your responsibility to contact the instructor within 24 hours of the scheduled class time.

Participation:
Students are expected to actively engage in any in-class discussions and activities.

Deadlines:
Students are expected to complete any assigned readings and come prepared to each class.

Deadlines for all assignments and projects will be specified when they are given. Any in-class assignments will be due by the end of class unless otherwise specified. Late or incomplete projects will result in grade reduction. In-class activities may only be made up if you are absent for a valid reason. The instructor reserves the right to change the dates and modify assignments as necessary, with advanced notification.

Evaluation Criteria:
Students will be evaluated on the quality of presentations made before the class and on the quality of their contributions in class discussions.

Grading:
Grading will be based on the Georgia Institute of Technology system. No plus or minuses will be applied to the final grade. However, plus and minuses will be used for all the submissions during the semester. Students will have one week after each project grade submissions to discuss any grading matters to the instructor.

The grade ranges are defined as follows:

90-100% = A
80-89% = B
70-79% = C
60-69% = D
0-59% = F

Grades will be based on projects and exams according to the following grading distribution:

Lab work	20%	In Class Assignments
Homework	30%	Outside of Class assignments
Online Practice	10%	Python Coding Bat and Code Academy Exercises
Participation	15%	Attendance, Participation, Blog Posts, Presentations
Midterm	10%	Paper Based Python knowledge and debugging test
Final Project	15%	Spatial Experience Analysis
Total	**100%**	

On-Line Resources:
The course will utilize T-Square (t-square.gatech.edu) for the distribution of class materials (such as lecture slides or supplemental readings), announcements, and for turning in class assignments and project presentation deliverables. Additionally, blogs about the readings, project progress, project presentation materials, and final project deliverables are expected to be posted to the class blog per team as per instructions in class. Class website: http://designscripting.gatech.edu/fall2014

Required Books/Reference Materials:
- CodingBat http://www.codingbat.com http://codingbat.com/python
- CodeAcademy http://www.codeacademy.com
- Learn Dynamo http://dynamobim.org/learn/
- Dynamo http://dynamobim.org/
- Vasari http://autodeskvasari.com/
- Decodes http://decod.es/

Recommended Books/Reference Materials:
- https://wiki.python.org/moin/BeginnersGuide/Programmers
- Python www.python.org

- The Nature of Code by Daniel Shiffman http://natureofcode.com/

General Notes (policies and procedures):
Special Needs:
All students with special needs, permanent or temporary disabilities are urged to contact their instructor or Troy Whyte (troy.whyte@coa.gatech.edu, 404-385-1275) for information or assistance to coordinate their service needs and/or visit the ADAPTS program website: http://www.adapts.gatech.edu/

The ADAPTS Office, located in the Office of the Dean of Students (ODOS), provides support and information regarding students with disabilities at the Georgia Institute of Technology. Assistance is also available for meeting the requirements of the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act of 1973. The ADAPTS-Disability Services Program assists students self-identifying as having a disability to obtain reasonable accommodations. Official documentation of disability is required to determine eligibility for accommodations or adaptations that may be helpful on campus. Staff members in the ADAPTS Office serve as full-time advocates for students with disabilities. Their role is to ensure that all students have physical and programmatic access to all college programs, thereby enhancing their interactions in all activities of the campus community.

Our purpose is to improve the educational development of students with disabilities and to enhance the understanding and support within the institute through equitable access, accommodations, and the provision of programs and services. ADAPTS operates under the guidelines of Section 504 of the Rehabilitation Act of 1973 and the 1990 Americans with Disabilities Act (ADA). ADAPTS serves any Georgia Tech student who has a documented, qualifying disability.

Student Bill of Rights:
1. The right to attend classes at regularly scheduled times without deviation from such time and without penalty if the student cannot attend instructional, lab, or examination hours not institutionally scheduled.
2. The right to consult with an assigned and qualified advisor for a reasonable amount of time each term.
3. The right to consult with faculty outside usual classroom time such as regularly scheduled office hours by appointment.
4. The right to have reasonable access to campus facilities of which use is required to complete course assignments and/or objectives.
5. The right to receive a syllabus for each course at the first class meeting. The syllabus should include an outline of the course objectives, criteria used in determining the course grade, and any other requirements. Students should be informed of any changes made to the syllabus with reasonable time to adjust to these changes.
6. The right to have reasonable time to learn course material prior to the administration of an examination.
7. The right of each student to receive access to any of his/her records kept by the institution.
8. The right to have reasonable access to grading instruments and/or evaluation criteria and to have graded material returned in a timely fashion.
9. The right to be informed of the grade appeals process.
10. The right to have reasonable facilities in which to receive instruction and examinations.
11. The right to be informed in each course of the definition of academic misconduct.

Contacting the Instructor for an Appointment:
If you would like to arrange a meeting or appointment, please speak with the instructor after class or contact the instructor via email (matthew.swarts@coa.gatech.edu). Please allow 24 hours for a response.

This syllabus may be subject to change during the course of the semester. If so, the syllabus will be updated online and you will be informed of the changes.