CODING DESIGN

Instructor: Maya Przybylski
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Class Meeting Time
Wednesdays: 10:00pm – 1:00pm
Room 2026

Office hours (by appointment)
Wednesdays: 1:30-2:30pm
Room 2018

INTRODUCTION

"Computer Science is no more about computers than astronomy is about telescopes"

Edsger Dijkstra (1930-2002), a Turing Award (1972) winning computer scientist known for his contributions to the development of programming languages, graph theory and distributed computing.

For many designers, the computer is just an advanced tool that enables, through the use of out-of-the-box software, the digitization of that which is predetermined and well-defined. In contrast to this view, characterized as computerization, an emerging expanded view of the role of the computer deals directly with computation – using the underlying principles of the computer's rule-based intelligence in order to determine formal and organizational strategies.

Coding Design posits that through working in the process-oriented methods associated with programming, new ways of design thinking are exposed. The course positions computers and their associated technologies not only as machines used in the imitation and appropriation of what is already understood but also as vehicles for exploring and visualizing what is yet to be discovered.

We will work in the Java-based Processing programming environment.

Processing is a programming language, development environment, and online community that since 2001 has promoted software literacy within the visual arts. Initially created to serve as a software sketchbook and to teach fundamentals of computer programming within a visual context, Processing quickly developed into a tool for creating finished professional work as well.

Previous exposure to writing/reading code is not required.

The seminar is open to graduate students.
If you are currently or have previously participated in ARCH393- System Stalker Lab, please speak to Prof. Przybylski prior to registering.

COURSE STRUCTURE

The primary format for learning takes place in the form of **hands-on lab sessions**. During these working sessions the instructor will walk through specific topics and issues after which students will engage in the lesson directly through working on various in-class exercises. Students will have the opportunity to develop the fundamental skills necessary to engage with the computational design discourse.

The learning culminates in the production of a **course project**. Students will choose between developing their own custom Processing application or writing a research paper. In either case it is expected that students situate their activities to reinforce learning of course materials by addressing relevant themes in their own research work.

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Session Topics
The goal for these working sessions is to allow for the students to become fully immersed in the conceptual frameworks and technical realities of working within a computational discourse. These sessions will move through basic coding components and culminate in the students' ability to develop custom algorithms for driving production of visual artifacts.

BASICS

The topics in this section will be covered in the course

1. *Introduction to Processing* – pixels, processing, interaction
2. *Programming Basics – variables, conditionals, loops, arrays*
3. *Program Organization – functions, objects, classes (OOP)*
4. *Development Resources – libraries, debugging*
5. *Transformation* – mathematics, transformation 2D,3D
6. *Randomness & Noise*
7. *Processing Images*
8. *Using External Data* – text, data input, data streams

ADVANCED TOPICS

The topics in this section will be explored as time permits. These topics will be selected and prioritized according to student interest.

9. *Advanced Graphics Algorithms*
10. *Custom Interactive Maps*
11. *Physical Computing/Arduino*
12. *RhinoScript/Grasshopper*

COURSE REQUIREMENTS & WEIGHTING

Lab Participation
Students are expected to be active participants in the workshop sessions. Attendance will be taken each week and more than one unexcused absence will result in a failing grade for the participation component.

Lab Exercises
Lab exercises will be assigned at the end of the first eight class sessions. Each exercise will be due (via electronic submission) prior to the following week's class.

Course Project
Students will choose between developing their own custom Processing application or writing a research paper.

OPTION 1: PROCESSING APPLICATION
Each student will be responsible for conceiving and developing their own Processing project. The expectation is that students isolate an aspect of their ongoing thesis work/studio work that could be explored within a computational/ processing environment.

OPTION 2: RESEARCH PAPER
Students will carry out a research project that will position the new skills acquired during the workshops within a broader design discourse. The research will be organized and presented in a research paper format (2500 - 3000 words).

A hand-out describing the requirements and evaluation criteria of each of the above options will be distributed early in the term.

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Final Grade Breakdown

Lab Participation:	5%
Lab Exercises:	20%
Course Project:	75%

REQUIRED TEXTBOOKS

Students should own or have ready access to the following text:

Reas, Casey. Fry, Ben. *Processing : A Programming Handbook for Visual Designers and Artist*s. Cambridge Massachusetts; London England : MIT Press, 2007.

Here is a list of texts that may be usefil for extra help or advanced development:

Jabi, Wassim. *Parametric Design for Architecture*. Laurence King Publishing. 2013.

Pearson, Matt. *Generative Art: A practical guide using Processing*. Manning, 2011.

Terzidis, Kostas. *Algorithms for visual design using the Processing language*. Indianapolis, IN : Wiley Pub., 2009.

TECHNOLOGICAL PLATFORMS + ACCESS

While there are numerous platforms suitable for the introduction of such techniques, we will be primarily working in a suite of tools built around *Processing*. It is expected that students have a computer loaded with the Processing development tools available during each session.

Processing is available for free from the project's website (http://processing.org)

The processing community is extremely active and well-supported. It is recommended that you take advantage of numerous online resources. Here are just a few:
Processing: http://processing.org/
http://www.shiffman.net/teaching/workshop/
http://www.openprocessing.org/

COMMUNICATION

During the course of the term, the instructor may need to send communications students. Please ensure your email address on file is current and that you have access to the course portal on LEARN. From time to time you will receive general communications from the instructor regarding course business. It is expected that you check your email address regularly, and that once material has been sent, it has been officially received. Copies of all official correspondence will be archived for future reference.

SCHEDULE

This list represents an exhaustive list of topics. The schedule of topics will be adjusted to respond to the pace of the learning as required.

W1	January 4	**Course Introduction**
		Lab Session 1 *[Language Elements 1]*
W2	January 11	Lab Session 2 *[Language Elements 2]*
		Lab 1 Exercises Due at 10:00AM (electronic submission)
W3	January 18	Lab Session 3 *[Drawing 1]* & Lab Session 4 *[Drawing 2]*
		Lab 2 Exercises Due at 10:00AM (electronic submission)
		COURSE PROJECT DEADLINE (PART 0: DECLARE OPTION - IN CLASS EXERCISE)
W4	January 25	Lab Session 5 *[Transformations & Arrays]*
		Lab 3 Exercises & Lab 4 Exercises Due at 10:00AM (electronic submission)
W5	February 1	Lab Session 7 *[Classes, Object Oriented Programming]*
		Lab 5 Exercises Due at 10:00AM (electronic submission)
		COURSE PROJECT DEADLINE (PART 1: PROPOSAL)
W6	February 8	Lab Session 6 *[Motion 1]*
		Project Working Session [time permitting]
		Lab 7 Exercises Due at 10:00AM (electronic submission)
W7	February 15	Lab Session 8 [Interaction/GUI]
		Project Working Session [time permitting]
		Lab 6 Exercises Due at 10:00AM (electronic submission)
		COURSE PROJECT DEADLINE (PART 2: SCHEMATIC DESIGN / BIBLIOGRAPHY)
W8	February 22	**READING WEEK - NO CLASSES**
W9	March 1	Lab Session 9 *[Image Processing]*
		Lab 8 Exercises Due at 10:00AM (electronic submission)
W10	March 8	Lab Session 10 *[topic TBD - based on student interest]*
		Project Working Session [12:00 - 1:00pm]
W11	March 15	Lab Session 11 *[topic TBD - based on student interest]*
		Project Working Session [12:00 - 1:00pm]
W12	March 22	Lab Session 12 *[topic TBD - based on student interest]*
		Project Working Session [12:00 - 1:00pm]
W13	March 29 Last Class	Project Working Session
	April 17	**COURSE PROJECT DEADLINE (PART 3: CODE / RESEARCH PAPER)**
	April 17 - 21	RESEARCH PRESENTATIONS / APP EXHIBITION (DATE & TIME TBD)
		COURSE PROJECT DEADLINE (PART 4: REPORT / RESEARCH PRESENTATION)

OFFICIAL BUSINESS

EVALUATION

Students must complete all projects and assignments and obtain a passing average in order to receive credit for this course.

DEADLINES & EXTENSIONS

ARCH 684 deadlines can only be extended in the case of illness or incapacity. Requests for such extensions must be made before the project deadline, as soon as is possible, using the request for extension form available from your program coordinator. Your request must be accompanied by a medical certificate when necessary, and must be submitted to the instructor.

Late submissions without approved extensions will lose 10% of project value per day.

SUBMISSIONS

Digital files are required to accompany all submissions. These submissions will be supported via LEARN. Students are to ensure access to the system.

AVOIDANCE OF ACADEMIC OFFENSES

Academic Integrity: In order to maintain a culture of academic integrity, member of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. Refer to Academic Integrity website (https://uwaterloo.ca/academic-integrity/) for details.

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70 (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) Student Petitions and Grievances, Section 4. When in doubt, please contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g. plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. For information on categories of offences and types of penalties, students should refer to Policy 71 (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) Student Discipline. For typical penalties check Guidelines for the Assessment of Penalties (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/guidelines/guidelines-assessment-penalties).

Appeals: A decision made or penalty imposed under Policy 70 (Student Petitions and Grievances) (other than a petition) or Policy 71 (Student Discipline) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 (Student Appeals)
www.adm.uwaterloo.ca/infosec/Policies/policy72.htm.

Note for students with disabilities: AccessAbility Services (http://uwaterloo.ca/disability-services/), located in the new addition to Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the office at the beginning of each academic term.

Turnitin.com: Text matching software (Turnitin®) will be used to screen assignments in this course. This is being done to verify that use of all materials and sources in assignments is documented. Students will be given an option if they do not want to have their assignment screened by Turnitin®. In the first week of the term, details will be provided about arrangements and alternatives for the use of Turnitin® in this course.