

ELECTRONIC LOGICS & CREATIVE PRACTICE

INSTRUCTOR | Erin Mallea

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UNITS | 12

TIME | 1:25–4:15pm, Mon/Wed

LOCATION | Hunt Library A10

LAB HOURS | 4:15–5:15 pm, Mon/Wed

Electronic Logics & Creative Practice

investigates the fundamentals of electronic computation as metaphors for art and interaction. Students explore technology through a creative lens, as conceptual and physical material to be manipulated and synthesized, by examining the basis of digital computation alongside contemporary and new media art practices. There are three main units: Gates (the logical building blocks of computers), Flow (ways in which signals "flow" through physical and electronic systems), and Arrows (the stacked layers of indirection used in modern computer systems). These major themes are addressed through lecture, readings, and the creation of individual and collaborative works. Throughout the semester students complete a series of quick thematic exercises and three larger-scale projects; these works are reviewed through meetings, group critique, and documentation. Our toolbox includes 7400-series logic chips, the Arduino electronics platform, software, wood, laser cut acrylic, found objects, props, projections, and glue. We address technical engineering subjects (e.g. Karnaugh maps) alongside art and performance theory. Students deepen conceptual skills while increasing the scale and ambition of creative output.

COURSE REQUIREMENTS

+ Attendance is required. Participation in workshops, discussions and critiques are a valuable part of the learning experience.

+ Guest lecturers / visiting artists are an important aspect of this course, therefore those visits will be timed to take place during our regular meeting sessions and attendance will be taken. Notify us ahead of time if you know you have scheduling conflicts.

+ Completion of projects demonstrating skill, creativity, and inventive problem-solving is expected.

+ Readings will be assigned and serve as background for assignments and discussions. Readings will be available as PDFs on Canvas.

+ You are required to participate in homework exercises and investigations, meant to expand your skill-set. Many of these will be a completion grade and will be discussed in class.

+ Conduct yourself professionally in time management and in communication with us, visiting critics, and peers.

INTENDED LEARNING OUTCOMES

+ **Build a body of work** that expands on technical and conceptual skills.

- Effectively draw upon a range of fabrication skills, and seek training and resources where needed in order to successfully bring concepts into three-dimensional form.
- Produce projects in which ideas, actions, and materials are effectively synthesized, and contribute to an evolving body of work that advances your practice and personal vision.
- Intentionally display / place your work to effectively emphasize its function, interactivity, appearance, and/or conceptual meaning, utilizing the properties of space, site, and context.
- Build interactive projects which respond to or are driven by your creative practice in relation to basic ideas in computer science, electrical engineering, and digital logic.

+ **Situate your body of work** in the appropriate

historical and contemporary context. Research, follow your inspiration, and do not be afraid to try new paths in your practice.

+ **Further develop your chops** for thoughtful conceptualizing, making, and discussing electronic logic and other technical paradigms in relationship to art and your creative practice.

+ **Be open to voice your ideas and thoughts and to contribute to group discussions.** Respect for others' feelings, beliefs and values are essential to the success of the class, so please be considerate of your classmates' different backgrounds and experiences as you perform and discuss various points of view. This course should be a safe space in which various perspectives are considered and discussed. Uncomfortable is okay when taking risks. We aim to create spaces of trust and respect to allow for risk. It is important for each student to set limits verbally and at any point during the process; please bring concerns to the group and/or professors. You are expected to be accountable for yourself and each other.

+ **Effectively document work** to communicate its physical presence and experiential qualities to an audience who may not have the benefit of experiencing it firsthand.

MAJOR PROJECTS

The *three major units of the course* are **Gates**, **Flow**, and **Arrows**. Each unit is animated by a major underlying concept drawn from electrical or computer engineering, complimented by creative practices and art. There will be technical homeworks and smaller orienting assignments designed to help you learn the relevant underlying theory and practice.

The major assignments ask students to respond with an originally fabricated interactive piece to a prompt. To briefly explicate each of the themes:

- **Gates** refers to the digital logic "gates" that are ubiquitous in computers, microcontrollers, and programmable electronics. Taken individually, a gate is an electronic implementation of a Boolean (mathematical) rule that describes a precisely defined relationship between inputs and outputs. The projects in this section explicitly employ

logic gates in the service of decisionmaking machines, computing devices, or other devices with multiple inputs from the world.

- **Flow** refers to the many ways in which impulses, waves, information, and signals "flow" through physical and electronic systems. Not moving instantaneously (although sometimes very quickly), impulses can take many different forms. Projects in this unit focus on creating a transduction (form-changing) flow in which a signal travels through multiple different media.
- **Arrows** refers to the many stacked layers of indirection used in the programming and operation of a modern computer or microcontroller system. Projects in this unit work off of the idea of arrows pointing to other arrows to simplify, complexify, or otherwise change meaning across layers of abstractions.

GRADING

Grades are determined by the completion of projects in class, as well as research and work completed outside of class. *The evaluation of creative work—especially emerging forms—is notoriously difficult and necessarily holistic, making specific grading rubrics difficult to develop.* Nevertheless, the following questions will guide the instructors in assigning grades.

- **LOCATE:** How well can the student articulate the cultural and artistic precedents alongside theoretical/engineering foundations of the unit's theme, as evidenced by the presentation, creative work, and project statement?
- **PROCESS:** Do the ideas presented at the beginning of the unit contain the germ of the eventual project?
- **PROCESS:** Does the project represent a clear evolution in thinking and making over the course of the unit?
- **FORM + FUNCTION:** How well do the project's media and execution reinforce its content?
- **FABRICATION:** Does the level of finish or craft reflect intentionality and reinforce the form and content?

- **CONTEXT:** How clear and well written is the project statement?
- **VISION:** Does the project represent the development of the student's artistic vision and contribute to a body of work?

Each project will receive a numerical grade in addition to verbal critique in class. Students are encouraged to contact the instructors at any time to learn how they are doing. Grades are recorded and communicated through the course Canvas site.

GRADING SCHEME

You will work on multiple activities in this class.

- + Participation (10%)
- + Homework & technical exercises (20%)
- + Project No. 1 (25%)
- + Project No. 2 (25%)
- + Project No. 3 (20%)

Projects generally have two grade components: **the project** itself and **documentation** of the project/process. Projects are graded based on their state at the time they are due, i.e. the day of the in-class or out-of-class exhibition and/or critique. **Documentation will be due by Friday at 5:00 p.m. the week of the critique.**

- A** – Excellent / outstanding effort above and beyond the requirements
≥90%
- B** – Good / above average achievement
<90% and ≥80%
- C** – Satisfactory / average work
<80% and ≥70%
- D** – Passing / below average performance
<70% and ≥60%
- R** – Failing to meet the lowest passing standard
<60%

SKETCHBOOKS

Please bring a sketchbook to class. Sketchbook pages can be used as documentation of the

genesis or development of a thought pertaining to a project (and are a welcome addition to your process documentation – hint hint).

PROJECTS & COLLABORATION

All IDeATe courses purposefully attract students from a wide disciplinary range, including art, design, engineering, architecture, computer science, business, science, and more.

There will be the option to make some projects in the course collaboratively. The expectation is that group members will honestly strive to work together on their projects and will rise or fall together. It is important to understand that identifying complimentary strengths and weaknesses early on will help your team succeed. All members of a group will receive the same grade for a project except in unusual circumstances.

Class time is precious—we've got only 6 hours a week, about 84 hours over the course of the semester. Because of this, we have some clear expectations for ourselves and for you:

- **We will get to class early and ready to go.** During class time, we'll focus exclusively on our course.
- **We'll use class time as effectively as we can:** for instance, if the whole group does not need to be involved in a discussion, we'll try to bring only the needed group together.
- **You'll also use class time carefully;** you will come on time and ready to learn. If you're late, please enter quietly and speak with us after class.
- **You'll use classtime to focus on the class,** and not the fun things happening inside your phone or out on the internet.

RECORDING CLASS

Please do not record class without obtaining prior written permission from us. If you have special dispensation via the Office of Disability Resources to record as an accommodation, then

of course, it is permissible.

ABSENCE

You are expected to attend class, and to arrive on time. Past experience has repeatedly shown that higher attendance correlates with greater success in the class, so it's in your best interest to come to class!

Any unexcused absences beyond your 2nd will result in a third of a letter grade (3 point) deduction from your final course grade.

If you're feeling ill, please email us advising of the circumstance as early as possible and focus on taking care of yourself. You will never be penalized for missing class for a health-related reason. Seek medical care as needed, and rest up so you can regain your health and return to full participation.

COMMUNICATION

We are happy to answer your questions, discuss your work, or respond to your concerns. Please come to lab hours, make an appointment, or ask questions via email. Email is the easiest way to reach us. We will try to respond to you within 12 hours during weekdays, and 24 hours over weekends.

PHONES

While we're in class, please don't use your phone for non-class purposes. If you need to use your phone to contact others, just step out into the hallway. If you're using your phone to look up information/resources/etc. for class, that's fine and there's no need to take special steps to remove yourself from the physical/virtual classroom. That being said, if we observe you using your phone in a non-academic way, we'll ask you to give it to us so we can put it in the phone basket at the front of the room; you're welcome to get it at the end of class.

While we're in class, please don't use your

computer for random internetting, social mediation, or any other use that isn't pertinent to class. You've got the whole rest of your life to TweetGram awesome memes and #tags.

The use of distracting technology is obviously deleterious to the student who's choosing to use it, but it's also harmful to other students who are merely sitting near the distracted student. Please do your best to focus on class during class.

ACADEMIC INTEGRITY

This is not a class, and IDEATe's Phys Comp Lab is not an environment, where you are expected to write every line of your own code or come up with all of your own electronics ideas. We gratefully stand on the shoulders of giants and also regular-sized heroes who share interesting projects and possibilities on Instructables, or Github, or their blogs. You are expected to incorporate ideas, hardware/electronics designs, and even verbatim software fragments from other sources. This isn't considered plagiarism in this class if: 1) you properly cite sources, and 2) you don't simply make a wholesale reproduction of somebody else's project but instead use their work as a jumping-off point. If you do plagiarize, however, you can expect a serious response, including a major grade penalty and referral to the University disciplinary structure.

If you're not sure if you're borrowing too much from somebody else, or you don't know how to credit the work you're borrowing from, please discuss it with the instructors.

INCLUSIVITY

We recognize the diversity of cultural identities, religious backgrounds, sexual orientations, and gender identities that are a foundation of our strengths as humans on this planet. This class is a safe space for self-identification, self-expression, and inclusivity. Students are expected to treat everyone with respect in our classroom and critique activities, which includes debate and the free exchange of ideas.

If you experience or witness lack of respect or

harassment in our classroom environment, or have any other concerns, please contact us immediately. We are always happy to make time to speak with you individually about any concern you've have; we're just an email away. If you would like to submit feedback or comments to us anonymously for any reason, please use this form we've created for that purpose. That form can be found on Canvas.

Additionally, there are University-wide resources for reporting incidents of bias or discrimination:

The Center for Student Diversity & Inclusion

- + email: csdi@andrew.cmu.edu
- + phone: (412) 268-2150

Report-It service

- + online anonymous reporting platform:
www.reportit.net
username: tartans
password: plaid
- + anonymous reporting via phone:
(877) 700-7050

ACCOMMODATION

In the spirit of encouraging everyone to be able to be maximally present in class together, it's important that students feel comfortable and supported. If there is anything physically in the environment that can be reasonably adjusted to make your learning experience better, you should feel generally empowered to make that adjustment. If the lights are too bright at your table, please ask your neighbors if it's ok to dim them, and if yes, go ahead and do so. If music at a work session is too loud, please say so. If you have any other concerns, please let us know.

If there is any aspect of instruction that is giving you difficulty, such as us not spending long enough on a topic or making reference to a point we haven't covered yet, please speak up. This sort of critique is very helpful to

maintaining a successful classroom and is much appreciated.

If you have a disability and have an accommodations letter from the Disability Resources office, we encourage you to discuss your accommodations and needs as early in the semester as possible. We will work with you to ensure that accommodations are provided as appropriate. If you suspect that you may have a disability and would benefit from accommodations but are not yet registered with the Office of Disability Resources, we encourage you to contact them at access@andrew.cmu.edu.

IDeATe

IDeATe, the Integrative Design, Arts, and Technology network at Carnegie Mellon, offers undergraduate minors and courses in Game Design, Animation & Special Effects, Media Design, Sonic Arts, Design for Learning, Innovation & Entrepreneurship, Intelligent Environments, Soft Technologies, and Physical Computing. These areas merge technology and creativity and provide learning opportunities for interdisciplinary collaboration. IDeATe minors and courses are open to all majors. We welcome students from every discipline to the unique learning environment that exists at Carnegie Mellon.

IDeATe RESOURCES

- Once you are enrolled in an IDeATe course, you will have access to **IDeATe Lending**, and you will maintain your access through the rest of your time at Carnegie Mellon.

Please visit resources.ideate.cmu.edu/lending for more detailed information on available resources, to review the IDeATe Lending Borrower Policy, and to find hours of operation.

- **IDeATe maintains three laser cutters** in the digital fabrication alcove off of room A5, and these tools are very precise, very fast, and very useful for all sorts of fabrication. **IDeATe's 3D printers** can be accessed via skylab.ideate.cmu.edu. Please allow at least 24 hours to retrieve your print.

- If you have questions or need advice about IDeATe minors or courses, please get in touch with Kelly Delaney, the Assistant Director of IDeATe. Her office is in Hunt A9 (immediately across the hall from the Phys Comp Lab) and her email is kellydel@andrew.cmu.edu.

TAKE CARE DURING A DIFFICULT TIME

We will be scheduling opportunities for one-on-one chats during the semester so we can check on your progress and wellbeing. We also ask that you reach out and contact either of us if there's anything that you think that we should know about your circumstances which can help inform our teaching and expectations.

Take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. Be sure to take breaks if you've got large blocks of screen time. Get some fresh air. There's a big beautiful park literally across the street from Hunt Library. Maintaining healthy habits will help you achieve your goals and cope with stress.

If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. Counseling and Psychological Services (CaPS) is here to help: **call 412-268-2922** or visit www.cmu.edu counseling. Consider reaching out to a friend, faculty member (we're always happy to talk), or family member you trust for help getting connected to the support you need.

CODA

Thank you for reading this syllabus. We've tried to be thorough in our discussion of the class so you have a good sense of what to expect and what we expect.

All of the structure provided by the rules, grades, and submission requirements are

present because we are operating in an academic environment that requires that we evaluate you as fairly as possible. Ultimately, our goal is to help you have a successful semester, and we ask you, again, to please reach out with any concerns you may have.

We hope you're taking this class because you're interested in learning something new and useful. We're teaching it because we sincerely believe that the ability and confidence to use these technological tools in relation to creativity and art can be transformative—and that it's good to work towards a world in which as many people as possible are empowered to solve meaningful problems in creative ways, build interesting things, and help enrich our shared experience.

We're looking forward to learning with you this semester.

Course Schedule

This schedule is only an outline. Dates and activities are subject to change. Additional readings not listed on the schedule will be assigned. The updated syllabus can be found on our course website: **courses.ideate.cmu.edu/62-362**

Students are invited to self-identify important observances of faith that pose conflicts with meeting times, assigned coursework, or critiques.

M 8.30	Hello there! Homework NO. 1: Assigned Who are you? ---
W 9.1	Homework NO. 1: DUE GATES Homework NO. 2: Assigned Logic Statements
M 9.6	NO CLASS ---
W 9.8	Homework NO. 2 DUE Homework NO. 3 Assigned Integrated Circuits

M 9.13	Guest Artist GATES IDEAS DUE: Individual Meetings – Sharing <i>Gates</i> project ideas w/ RZ&E Homework NO. 3 DUE Homework NO. 4 Assigned Integrated Circuits cont'd. ---
W 9.15	Group Check-in of refined ideas – share process blog Homework NO. 4 DUE Work Day

M 9.20	Work Day ---
W 9.22	IN PROCESS CRITIQUE for GATES

M 9.27	Work Day Share Process blog – check-in with instructors ---
W 9.29	Group Check-in of refined ideas – share process blog Work Day

M 10.4	GATES FINAL CRITIQUE ---
W 10.6	FLOW Introduction: Arduino & Electronics I Homework NO. 5 Assigned Arduino & Electronics I ---
F 10.8	Documentation DUE for PROJECT NO. 1 at 5:00 PM
M 10.11	Guest Artist Homework NO. 5 DUE Arduino & Electronics II Homework NO. 6 Assigned ---
W 10.13	Homework NO. 6 DUE
M 10.18	FLOW IDEAS DUE: Individual Meetings – Sharing <i>Flow</i> project ideas w/ RZ&E ---
W 10.20	Group Check-in of refined ideas – share process blog Work Day
M 10.25	Work Day ---
W 10.27	IN PROCESS CRITIQUE for FLOW
M 11.1	Work Day ---
W 11.3	Work Day
M 11.8	FLOW FINAL CRITIQUE ---
W 11.10	Guest Artist: Isla Hansen ARROWS Introduced Documentation DUE for PROJECT NO. 2 at 5:00 PM
M 11.15	ARROWS IDEAS DUE: Individual Meetings – Sharing <i>Arrow</i> project ideas w/ RZ&E ---
W 11.17	Group Check-in + share process blog
M 11.22	IN PROCESS CRITIQUE for ARROWS ---
W 11.24	NO CLASS

M 11.29

Work Day

W 12.1

\\ ARROWS FINAL CRITIQUE ///

F 12.3

Documentation DUE for PROJECT NO. 3 at **5:00 PM**