NIVEDITA ARORA | **TEACHING STATEMENT**

My goal as an educator is to train the next generation of socially responsible, fearless engineers and designers who are comfortable maneuvering between deep technical fields with an eye for connecting them into systems that create meaningful experiences and applications. For this, I believe in bringing my passion for the subject and positive energy to the classroom/lab. I will create an engaging and inclusive learning environment that encourages students to think, question, and apply abstract concepts to build solutions.

Teaching experience and philosophy

I have been a teaching assistant six times at Georgia Tech. During this time, I have covered both theoretical and hands-on courses such as *Artificial Intelligence and Mobile and Ubiquitous Computing.* I have designed and conducted labs, hosted weekly office hours, created and graded exams, and have mentored numerous individual and group long-term projects. Additionally, I have also given guest lectures about my research on sustainable computational materials in classes like Prototyping Interactive Systems and Embedded Systems. My teaching philosophy is grounded in the following pedagogies:

1) Paint the big picture before diving deep: Learning theoretical concepts can often be dull for students unless they understand the bigger picture. For example, as part of a lecture on game trees in Artificial Intelligence class, I found playing a game of Othello at the start of the course helped pique students' interest in learning about heuristic functions. In my future classes, I aim to inspire students with real-world application examples and stories of scientific breakthroughs and invite guest lecturers to share their ongoing relevant research on the topic.

2) Learning by doing: I am a big believer in fabricating material devices, building and taking apart circuits, and tinkering with code. This facility helps students develop creative modifications far beyond the theoretical concepts taught in the class. For example, I designed and conducted a lab activity in the Mobile and Ubiquitous Computing (MUC) class where students had to use sensors in a smartphone for step counting. Here students first explored the types of sensors that can be employed (accelerometer, gyroscope, and barometer) and then used them to count steps for different kinds of activities (walking, running, and climbing stairs). My favorite moment was when students discovered how a barometer is easier for counting the number of stairs climbed than an accelerometer. Over the last three years, this step-counting lab activity *I designed has been adopted as a regular part of the MUC class curriculum and is being extended to the online version, which will reach thousands of students a year.*

3) Encourage group activities: To be well-rounded designers and engineers, it is important to know how to work with teams and provide constructive feedback, especially in interdisciplinary research. I have mentored two to three semester-long group research projects every semester for the last four years, where students have gone from an idea to demoing a full prototype. Group activities allow students to understand each other's perspectives, build a common language of communication, divide tasks, fail and rise back together. In my classroom, I will introduce activities like think-pair-share, jigsaw, and semester-long group projects, where they learn how to divide tasks and accomplish them effectively.

4) Clear communication of ideas: Being an effective communicator is an essential skill for success in academia and industry. I believe communication is not just a tool for sharing knowledge or progress but, foremost, a powerful method to crystalize one's thoughts and reflect deeply. In my class, I will encourage both written and oral communication formats. I will introduce reflection articles, poster sessions, flipped classrooms, and demos as part of the curriculum.

5) Socially responsible inclusive classroom environment: I want to hone students to be global citizens and thinkers. As part of my lectures, I will talk about the role of technology for climate change, sustainability, health, and accessibility. Students will reflect on how the technology they create and use impacts the world. In addition, as an educator, I consider it my responsibility that all students, especially minorities, feel included, encouraged, and represented. Previously, as a female TA, I have observed that I attracted more female students during my weekly office hours than my male counterparts. I have specifically tried to highlight inventions by women and those of underrepresented cultures and countries in my 1-1 conversations with students. It is not enough just to motivate underrepresented minorities but also to sensitize everyone to these concerns.

I believe in being flexible and responsive to student feedback. I will adopt unofficial mid-term class feedback from students to check how they are doing with the coursework. I will revise methods and tools of instruction constantly to be a

more effective instructor. Some of the techniques that I plan to adopt for online/hybrid teaching are take-home electronic kits; chat tools to capture the free-flowing discussions and casual dynamic of a large group; and a scheduling system for bulky and expensive tools.

Mentorship experience and philosophy

One of the most rewarding experiences in my Ph.D. has been the opportunity to mentor students, see them learn new concepts, contribute to projects, and in the process, grow both as individuals and researchers. I have mentored about 50 undergraduate and graduate students from diverse majors like ECE, CS, HCI, Design, and ME. Eleven of them have been on publications or patents with me, out of which five are women. The students I mentored have also received admission in the Ph.D./MS programs at UW, Georgia Tech, Stanford, CMU, or joined full-time at industry giants like Google, Amazon.

1) Be an advisor with the spirit of a collaborator: As an example, Ali Mirzazadeh, who joined the ubicomp lab as a sophomore and has worked with me closely for almost three years, is the second author for the MARS project that was presented as publication and demo at UIST'21. I am particularly proud of his growth as a full-stack researcher, going from device fabrication to design. He was awarded the GVU Foley Distinguished Master's Student Award and is currently Ph.D. student at MIT.
2) Support entrepreneurial efforts: I believe that taking research to market is as important as creating new research. There are many students who join the lab to build the foundations of an entrepreneurial career. For example, inspired by initial prototypes for my building wrap-based water leak detection system, Sarthak Srinivas, an undergrad in our lab, received a $50,000 NSF I-Corps program award to conduct market exploration for the idea.
3) Human first, researcher later: I will build a healthy, sustainable, and mutually supportive lab culture. I strongly advocate for a human-first-researchers-later philosophy, where I promote healthy mental and physical well-being [1]. I truly believe the role of a graduate advisor is more than just an intellectual advisor; thus I will augment my mentoring by sharing healthy life processes that I have learned over the years.

Future Teaching Plan

My background spanning material science, ECE, CS, and HCI, and my passion for sustainability have prepared me to design and teach courses at the intersection of these fields:

Introduction to Material Science for Non-material Scientists: While designers and system researchers work with materials and devices all the time, they often lack access to novel material technology and the mindset to use them in their creative design process. This course will teach ECE/CS/design students how to form a common language of communication with material scientists. It will walk them through the fabrication of basic computing devices (sensors, actuators, batteries, transistors, and displays), and how to change material properties based on the application in mind. The students will learn to read material science journals and do speculative design thinking about the ecological, social, and political implications/ applications of such new technology.

Sustainable System Design and Applications: This course will cover an array of low-power technologies (self-powered sensors, backscatter communication, intermittent computing, neuromorphic computing, and electrochromic displays) that enable the creation of sustainable battery-free systems. It will cover the basics of the fabrication of computing devices that are biodegradable, thin, and flexible. Students will think critically about matching power budgets to what can be harvested in a particular application scenario. They will also consider product design features that can encourage behaviors towards recycling/ reuse/decomposition.

I am confident teaching both **undergraduate and graduate-level courses in core electrical and computer engineering** with focus on ***Circuits*** (Embedded Systems Design, Energy Harvesting Devices) **and Systems** (Mobile and Ubiquitous Computing, Embedded Systems, Sensor Networks, TinyML). With a background in **Human Computer Interaction (HCI) and fabrication,** I am interested in teaching Rapid Hardware and Software Design and Engineering Interactive Technologies. As a CS graduate major, I am equipped to teach basic computer programming courses like Object-Oriented Programming: Design and Development with C++ and Software Foundations.

[1]https://news.umich.edu/grad-students-suffer-high-levels-of-mental-health-stress-but-pandemic-provides-opportunity-for-change