



# CLEVELAND STATE UNIVERSITY

## Advanced Technology in Society Graduate Certificate Proposal

### **Overview**

Advanced Technology in Society (ATS) is a broad concept that includes technologies that shape and reshape human interaction with the environment. This document proposes a 4-course Advanced Technology in Society graduate certificate. It outlines the background of ATS at CSU, the rationale for this certificate, and the admissions process and courses intended for the certificate program. Courses will be offered through the Levin College of Urban Affairs but will be highly interdisciplinary. The program will involve faculty and be open to students from various colleges. The Advanced Technology in Society graduate certificate will prepare professionals and scholars for the future of work and society in which emerging technologies profoundly impact on our understanding of what it means to be human.

### **History**

CSU faculty and staff have been building momentum around ATS research and community engagement through partnerships, centers, and initiatives for the past 5 years. These efforts are both informal and formal—including the IoT Collaborative, T.E.C.H. Hub, and Public Interest Technology University Network membership—and have resulted in interest from the community, research, and increasing faculty involvement in this work.

In 2017, CSU formally established a footprint in transdisciplinary ATS research through the IoT (Internet of Things) Collaborative. Funded with support from a Cleveland Foundation grant, the IoT Collaborative is a partnership with Case Western Reserve University aiming “to drive transdisciplinary research, education and innovation in IoT to spur intellectual discourse and economic transformation in order to improve the quality of life for residents of greater Cleveland.” The IoT was an early indication of the support and interest in work related to ATS from colleagues across universities, philanthropy, and the community of Greater Cleveland.

With continued funding from the Cleveland Foundation in 2020, CSU deepened its efforts in ATS research by establishing a new research center, the CSU T.E.C.H. Hub. The T.E.C.H. Hub was created to serve “as an anchor and beacon for research and education related to advanced technology in society.” The T.E.C.H. Hub engages faculty members from various disciplines and colleges across the university to build a critical mass of researchers and educators interested in ATS.

In 2020, Cleveland State University was accepted as a member of New America’s Public Interest Technology University Network. This network is a “partnership that fosters collaboration between universities and colleges committed to building the nascent field of public interest technology and growing a new generation of civic-minded technologists. Through the development of curricula, research agendas, and experiential learning programs in the public interest technology space, these universities are trying innovative tactics to produce graduates with multiple fluencies at the

intersection of technology and policy.” CSU is among over 40 innovative universities who are part of this network.

The Washkewicz College of Engineering’s Center for Human-Machine Systems (CHMS) is another transdisciplinary ATS thrust at CSU. Led by Dr. Eric Schearer, this team includes faculty from across campus seeking to improve technologies particularly for people with physical disabilities. An interdisciplinary group is in the process of completing National Science Foundation Teaching and Research proposal. Should this be awarded, the four proposed courses contained in the ATS certificate would become part of the NSF proposed interdisciplinary training initiative.

In addition to these CSU-based initiatives, CSU faculty (including Dr. Nicholas Zingale and Dr. Kelle DeBoth) and colleges (Maxine Goodman Levin College of Urban Affairs) have participated in partnerships and collaborative research and teaching related to ATS through the Human Fusions Institute and the University of Rijeka, Croatia. Both of these efforts include multi-institutional and international partnerships related to the curriculum and student enrollment.

Despite these research and engagement efforts, there has not been a formal and continued curricular component for ATS at CSU to teach scholars about and prepare professionals for advanced technology in society.

### **Rationale**

#### ***National***

According to the Bureau of Labor Statistics, in 2021 the three fastest growing industries in America are health care, energy, and technology and data science- all industries which are increasingly incorporating advanced technologies. Advanced technology is becoming more ubiquitous across almost all sectors and prevalent in almost all aspects of our world. Therefore, it is critical for higher education to prepare students to develop, manage, understand, and lead not only the technologies, but also the broader, societal implications of these technologies. We must prepare our technologists, engineers, social scientists, urbanists, and computer scientists, to think beyond the technology they are creating. At the same time, we must prepare our public administrators, policy makers, business leaders, educators, and healthcare workers to understand the role these technologies are and will play in our work and lives. The ATS graduate certificate will accomplish both by bringing together these fields through a transdisciplinary curriculum.

In the 2016 report “[Preparing for the Future of Artificial Intelligence](#)” by the Obama administration’s National Science and Technology Council Committee on Technology, the first recommendation encourages public and private institutions “to examine whether and how they can responsibly leverage AI and machine learning in ways that will benefit society.” This is a call for universities to incorporate ATS initiatives into their curricula and research. Later recommendations are for agencies to “draw on appropriate technical expertise at the senior level when setting regulatory policy for AI-enabled products” and for universities to “include ethics, and related topics in security, privacy, and safety, as an integral part of curricula on AI, machine learning, computer science, and data science,” both which emphasize the need for inter- and transdisciplinary training, including but not limited to future policymakers and technologists, around ATS.

In 2018, the [Ford Foundation](#) blogged about public interest tech as “a growing field you should know about,” and pointed out that there is an increasing number of organizations seeking tech expertise. A 2019 piece by the [World Economic Forum](#) pleaded for greater collaboration between

policy and technology, and to educate more public-interest technologists. Also in 2019, the [Carnegie Endowment for International Peace](#) argued, “Technological innovation is largely taking place beyond the purview of governments. In many cases, the rate of innovation is outpacing states’ ability to keep abreast of the latest developments and their potential societal impacts...A greater number and variety of actors must be involved to initiate, shape, and implement both technical and normative solutions. Yet, like governments, many of these other actors do not have (or simply do not invest in) the means to consider the broader, cross-border societal implications of their investments, research, and innovations.” Universities like CSU can and should be leading this charge.

### ***Local***

In summer of 2021, a survey was conducted to around 50 stakeholders across sectors in the Greater Cleveland area and beyond to better understand how people currently perceive ATS, where ATS currently is being talked about in their workplace, and what skills should be required of ATS specialists in the workforce. 100% of survey respondents said they anticipate the need for an ATS specialist in for-profit organizations within the next 5 years, 91% in government organizations within the next 5 years, and 89% within nonprofit organizations within the next 5 years. Over 90% of respondents expect the need for an ATS specialist within the next 5 years in aeronautics, agriculture, construction, education, finance, healthcare, IT, manufacturing, natural resources, business services, security/military, and trade/transportation/utilities. 84% said the same for leisure, hospitality, and recreation, 80% said the same for social services, and 67% said the same for arts and culture.

Over 75% of respondents believe ATS should be discussed in the academic fields of policy, ethics, education, computer science, business, medicine, data science, engineering, and urban planning. Over 40% of respondents said the same for philosophy, anthropology, psychology, social work, law, urban affairs, and design. Others added economics, library science, and agriculture. One participant noted, “this is such a ubiquitous part of our current and future society, I can’t think of a field where it shouldn’t be discussed!” These results suggest the need for an interdisciplinary or even transdisciplinary approach to an ATS curriculum, as well as the need for all disciplines—beyond STEM—to be addressing emerging technologies and its impacts on society.

### **University Curricula**

Currently, there is a limited but increasing number of other universities offering graduate degrees or certificates for Advanced Technology in Society or Public Interest Technology. Beyond the PIT-UN, academic programs such as degrees and certificates for both undergraduates and graduates related to technology and society are becoming more numerous, and are offered by forward-thinking universities such as [Arizona State University](#), [Arizona University](#), [Virginia Tech](#), [Ohio University](#), the [University of Washington](#), [Brown University](#), the [University of Maryland](#), and [Princeton University](#). Cleveland State University would join this list of pioneering universities by offering a graduate certificate in ATS, a unique take on Public Interest Technology that emphasizes human-centered approaches to emerging technologies, to scholars and practitioners in the Greater Cleveland area.

### **ATS Initiative at CSU**

The graduate certificate in Advanced Technology in Society will be part of a larger initiative in ATS at CSU. The ATS initiative will include this new graduate certificate curriculum in addition to student-led pedagogy and projects, community engagement, and faculty-led research. Core to the Advanced Technology in Society program is a transdisciplinary, student-driven effort through which graduate Student Innovation Fellows develop creative and experiential pedagogical approaches for the certificate's curriculum. This program will also be connected to research occurring at CSU regarding human-machine connections among people with disabilities as well as at the multi-university Human Fusions Initiative focused on healthcare avatars and the transfer of touch via the internet. Partners include local community partners, Case Western Reserve University, and the University of Rijeka in Croatia.

The Advanced Technology in Society program will be a transdisciplinary effort which spans all colleges within the university. It will focus on three primary areas:

1. **The “sylicarbon trifecta”** of human-machine connections (where new technology is being built, a primarily Engineering-driven area involving connections of devices to humans), artificial intelligence (deep learning devices that are shaping what we know, learn, and experience, including city sensor technologies), and extended reality (how augmented and virtual reality is shaping human potential and the way we experience the world).
2. **The Human, Ethical, Legal, Phenomenological, Psychological and Societal (HELPPS) impacts of advanced technology in society**, where larger questions about why, how, and when guardrails are needed on the new tech development and deployment - not only privacy and cybersecurity, but even more. It will ask big questions like: Do we need a constitution for humanity. What do we want the future of life to look like? What types of laws, policies and programs might be needed? What should be the role of government?
3. **Transdisciplinarity**, where questions of process are being addressed: how do we get multiple disciplines working together routinely in this area? What are the tools and techniques? Who should lead? How does it work? Where are we getting stuck?

### Admission to the Program

Degree-seeking graduate students who hold regular admission status at CSU may be admitted to the certificate program. Alternatively, the applicant must meet the graduate certificate admission requirements detailed in the admission section of the Graduate Catalog. With program permission, non-degree graduate students may take the courses noted below, but non-degree graduate students cannot earn a university graduate certificate. The director of the CSU T.E.C.H. Hub would serve as coordinator of this graduate certificate program.

### **Admission Requirements**

- Submission of application for certificate admission and **application fee**.
- Official transcripts confirming completion of baccalaureate degree and either enrolled in a graduate degree and/or providing evidence of 5-years of professional experience.
- One of the following admission criteria:
  1. For bachelor's degrees earned within the past six years, the applicant must have a minimum cumulative GPA for the bachelor's degree of 2.75 (4 point scale),
  2. OR if the bachelor's degree is more than six years old, the applicant must have a minimum 3.00 cumulative GPA,

3. OR a minimum GRE score of the 50th percentile,
4. OR completion of 12 graduate level credits at CSU with a minimum "B" in each course,
5. OR completion of regionally accredited U.S. masters or Juris Doctorate degree

### **Proposed Courses**

The graduate curriculum will consist of 12-credit hours through 4 graduate-level courses, including:

1. ATS/UST XXX: Smart and Sensible Cities Around the World (4-credits)
2. ATS/UST XXX: HELPPS Approaches to Advanced Technology in Society (4-credits)
3. ATS/ESC XXX: Disability, Empathy, and Technology (3 credits)
4. ATS/UST XXX: Transdisciplinary Perspectives (1 credit)

### **Course Descriptions**

**ATS/UST XXX: Smart and Sensible Cities Around the World:** This course will analyze smart and sensible cities in an international context, comparing the adoption, acceptance, and effectiveness of smart city technologies across different geographical, societal, political, and cultural settings. Students will understand what and how smart technologies have developed in local and global cities. Topics will include the current state of smart city technologies, the potential impact of smart cities on equity and sustainability, and the future of smart and sensible cities.

**ATS/UST XXX: HELPPS Approaches to Advanced Technology in Society:** This course is designed to understand the HELPPS- the Human, Ethical, Legal, Phenomenological, Psychological, and Social- impacts of a tech-fused humanity in which the duality of body and technology gradually fades. The approach interrogates the future of life at the intersection of artificial intelligence, AR/VR/UX (augmented reality, virtual reality, and user experience), and multi-sensory transfer - coined by Dr. Nick Zingale as the "sylicarbon trifecta."

**ATS/ESC XXX: Disability, Empathy, and Technology:** This course aims to introduce students to the experience of people with disabilities and to develop empathy in students so they can have effective working partnerships with people with disabilities. Students will participate in four elements: 1) Presentations by experts in disability and assistive technology 2) Classroom training in empathy skills 3) Interactions with students in other disciplines 4) Personal encounters with people with disabilities in the classroom, the clinic, and in the home

**ATS/UST XXX: Transdisciplinary Perspectives:** Transdisciplinary Perspectives introduces students to transdisciplinary theory, perspectives, and processes as well as tools and techniques for successful transdisciplinary research in human-centered technology. Transdisciplinary approaches are becoming more prominent as research attempts to tackle today's bigger, more complex global challenges. Through this course, students will learn how they might use this approach to dissolve traditional disciplinary boundaries and engage community members with lived experience as part of the research team, allowing for the emergence of new ideas to benefit society. Through literature and case studies, this course provides the intellectual and contextual foundations for this type of convergent research and

encourages students from various disciplines to explore how they might approach wicked problems at the intersection of humans and machines through a transdisciplinary research lens.

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