

Diversifying our Technical Workforce to meet National Needs including the CHIPS Act Initiative



The electronic industry has an urgent need to increase the technical workforce and address challenges related to recruitment, inclusion and retention of diverse talents. The panelists will discuss the development of initiatives, policies and programs to increase and diversify the workforce. Discussions will include both successes and challenges associated with achieving these goals.

Chairs: Kim Yess and Nancy Stoffel (ECTC) & Cristina Amon (ITherm)

Panelists:

Dereje Agonafer: University of Texas Arlington

Courtney Power: NextFlex

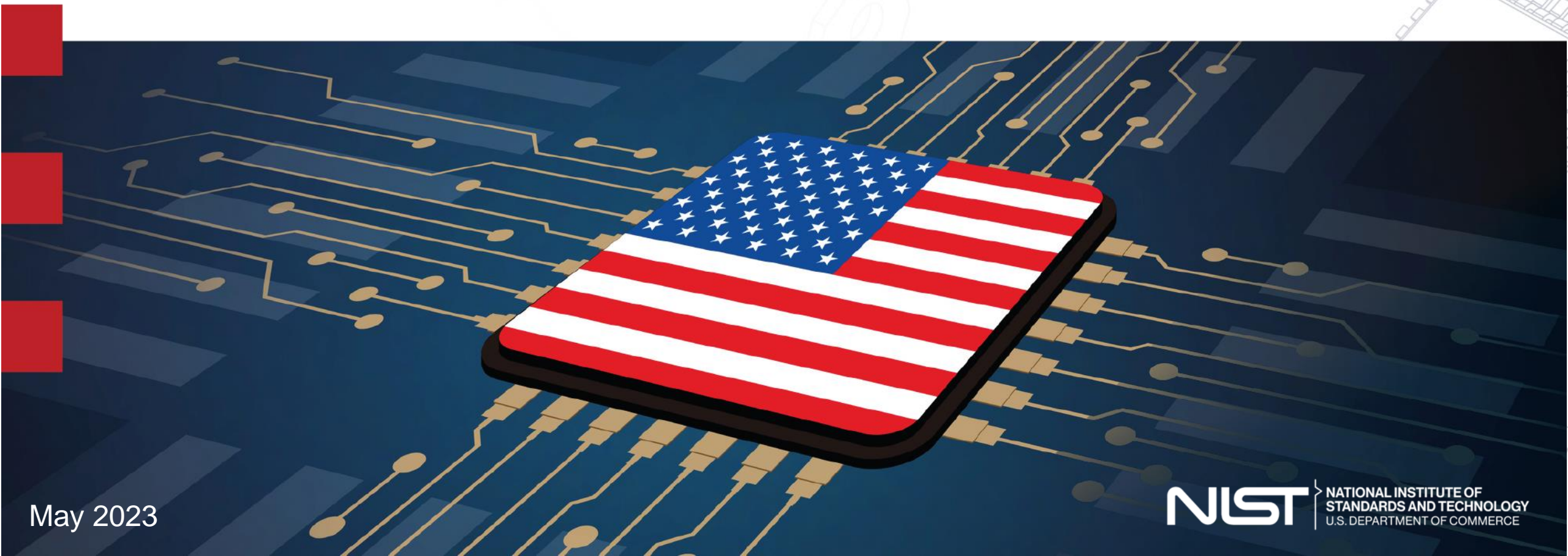
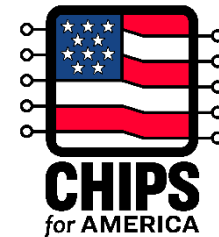
Jennifer Edwards: GE Foundation/NEXT Engineer

Christine McGinn: NIST CHIPS



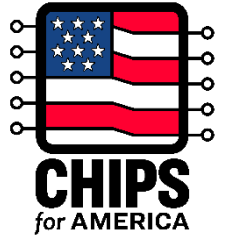
CHIPS for America Overview

Christine McGinn



May 2023

CHIPS for America



\$39 billion for incentives

Two component programs:

1. Attract large-scale investments in advanced technologies such as leading-edge logic and memory
2. Incentivize expansion of manufacturing capacity for mature and other types of semiconductors

\$11 billion for R&D

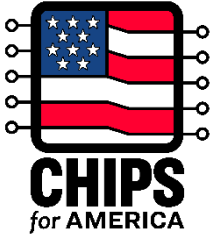
Four integrated programs to:

1. Conduct research and prototyping of advanced semiconductor technology
2. Strengthen semiconductor advanced test, assembly, and packaging
3. Enable advances in measurement science, standards, material characterization, instrumentation, testing, and manufacturing

Plus CHIPS initiatives from other agencies, including DOD, State, NSF, and Treasury

Workforce development

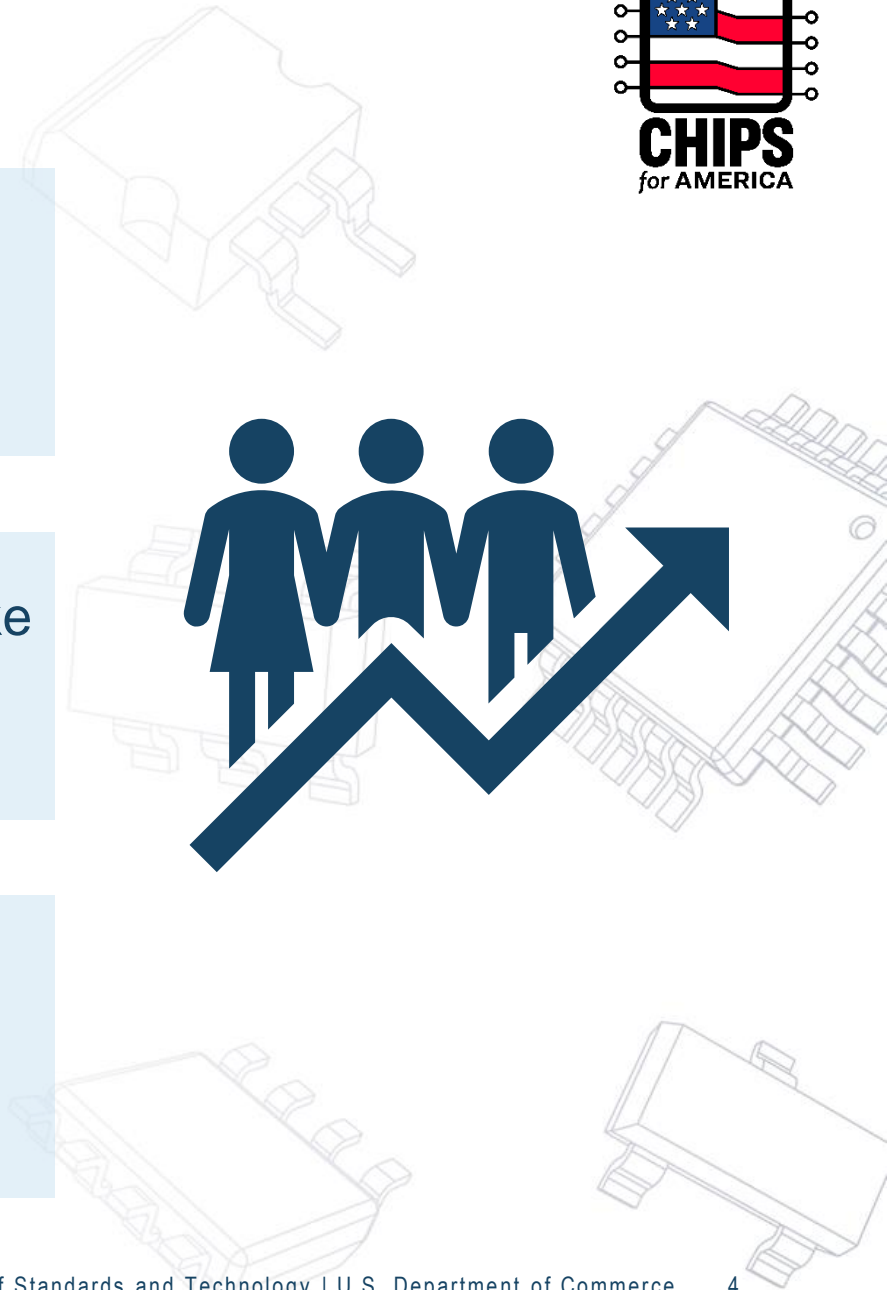
Workforce Development Vision



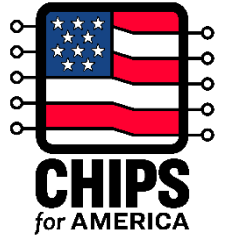
Delivering on our **national and economic security objectives** demands **major investments in the semiconductor workforce** that will support **good-paying jobs across the industry.**

America's diversity is a comparative advantage; we must make significant investments to create opportunities for **Americans from historically underserved communities.**

Effective workforce solutions **enable key stakeholders to work together.**



The Workforce Development Guide helps applicants think through the best models for them and submit strong workforce plans



1. CHIPS Workforce Values

2. Partnerships

3. Facility Workforce Plan



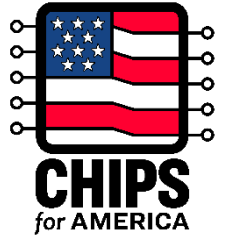
4. Construction Workforce Plan

5. Child Care Plan

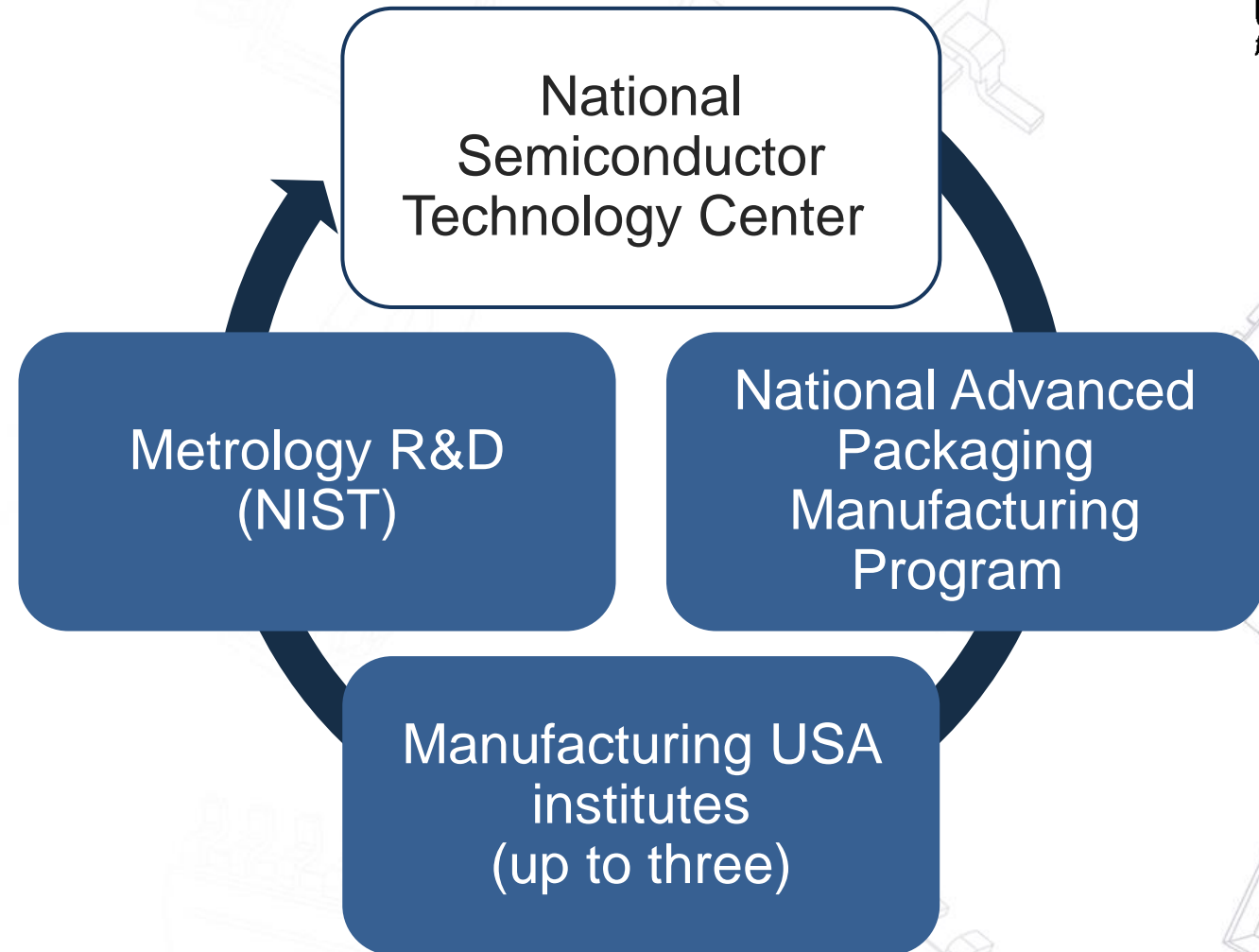
6. Guidance on Submitting Successful Plans

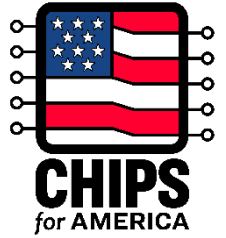
Appendix & Resources

Workforce is Critical to CHIPS R&D

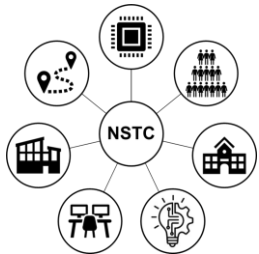


Training in real-world and cutting-edge capabilities





CHIPS R&D EWD Goals



- Strengthen local partnerships focused on EWD to support semiconductor career pathways
- Identify opportunities for scaling of effective programs to meet Secretary Raimondo's stated goal of 3X graduates in semiconductor-related fields in the next ten years
- Create resources that lower barrier to entry and broaden participation in semiconductor-related fields
- Expand outreach about semiconductor opportunities in local communities

GE FOUNDATION



Committed to **transforming** our communities and **shaping** the diverse workforce of tomorrow by leveraging the power of GE

Use intentionality to connect philanthropic focus to GE's mission and purpose

GE PURPOSE

**GE
BUSINESSES**

GE PEOPLE

BUILD UPON
100-YEAR
HISTORY

STRATEGY

- Future Vision
- Focus for Impact
- In GE communities
- Engage GE People
- Clear and Simple Messaging

ENGINEERS



NEXT ENGINEERS is a college readiness program inspiring and guiding 8th to 12th graders (ages 13-18) to pursue engineering in higher education. The program focuses on increasing diversity of students in engineering.

STRUCTURE

Global program launched Fall 2021 in
GE communities running for a minimum of 5 years

ENGINEERING DISCOVERY

ENGINEERING CAMP

ENGINEERING ACADEMY

Age 13



Age 18



GLOBAL IMPACT – YR. 1

- ✓ Over 8,100 students reached
- ✓ 70%+ underrepresented students, 47% girls
- ✓ 4,600 GE volunteer hours

ADVANCED MANUFACTURING TRAINING EXPANSION PROGRAM



Collaborative, systems-based WFD initiative to build a pipeline into advanced manufacturing

STRUCTURE

Local program launched Fall 2019
on MA North Shore running for 6 years

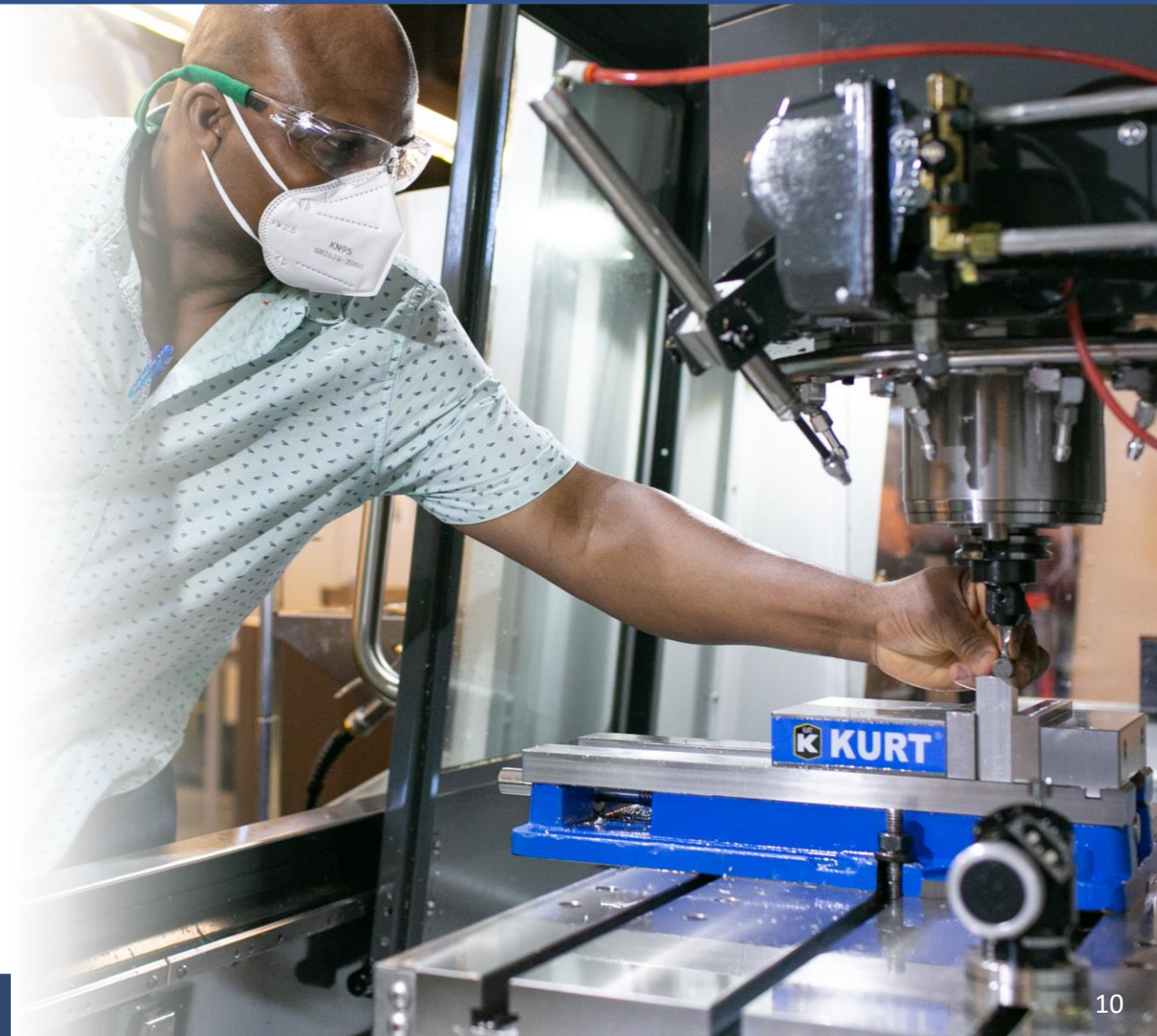
AWARENESS AND RECRUITMENT

CURRICULA AND INFRASTRUCTURE

INDUSTRY ENGAGEMENT

IMPACT TO DATE

- ✓ Over 300 adults trained, 500+ students engaged
- ✓ 83% employment rate, 25% increase in wages
- ✓ 60% people of color
- ✓ Over 70 pieces of equipment installed



MASSACHUSETTS MARITIME ACADEMY (MMA)



Increase the **diversity** of students pursuing education and careers focused on **clean energy**

STRUCTURE

Local programming launched in 2022 with endowed scholarship in MA

CAREER EXPLORATION

UNDERGRADUATE/GRADUATE

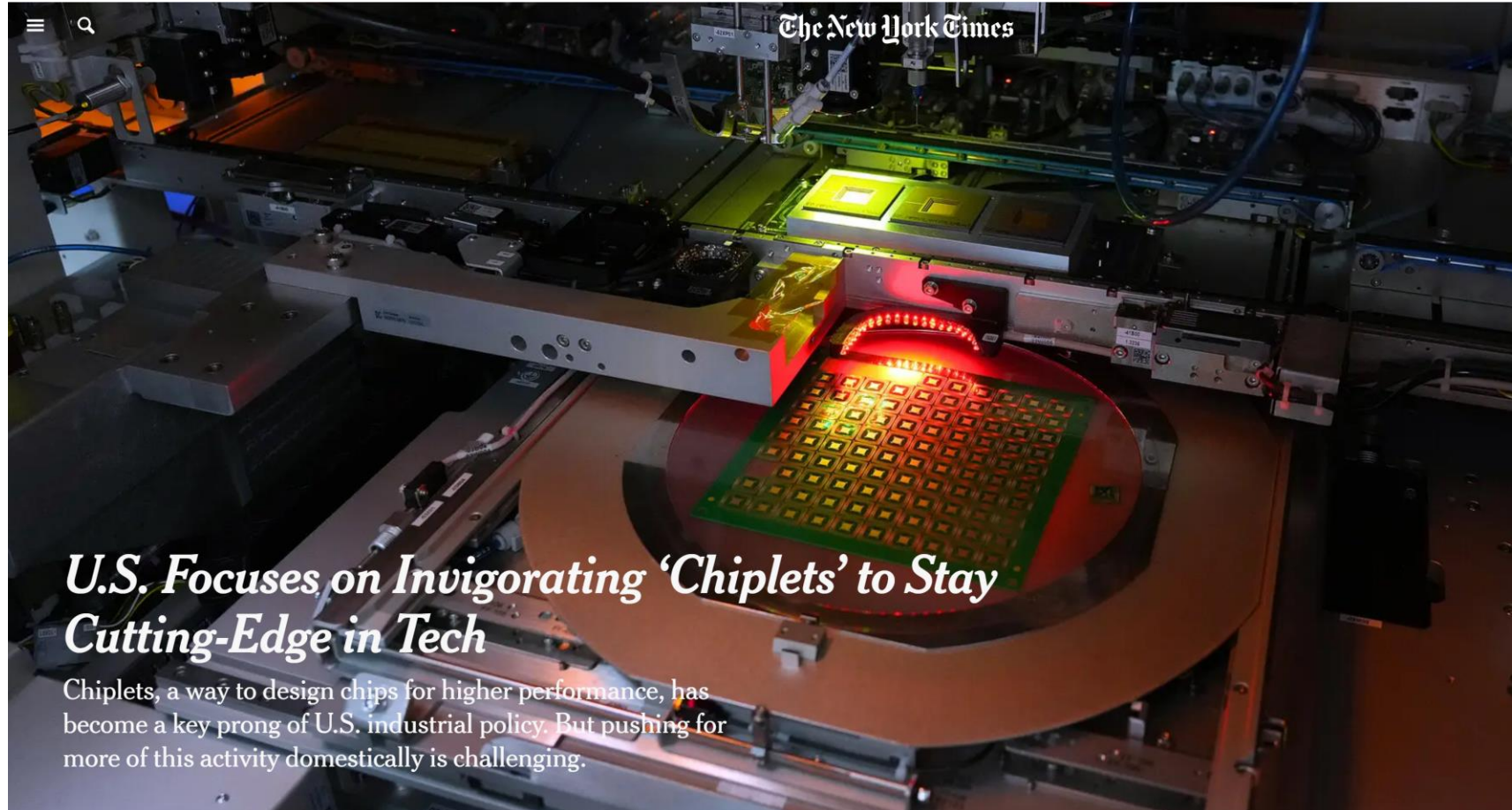
TECHNICAL/TRADES CERTIFICATIONS

IMPACT

- ✓ 47 scholarships offered annually
- ✓ Programming running into **perpetuity**
- ✓ Focused on **increasing diversity**



Packaging going mainstream – NYTIMES - “As chips get smaller, the way you arrange the chips, which is packaging, is more and more important ...,” Commerce Secretary Gina Raimondo, said in a speech at Georgetown University in February.



Then more than a decade ago, engineers at the chip maker Advanced Micro Devices began toying with a radical idea. Instead of designing one big microprocessor with vast numbers of tiny transistors, they conceived of creating one from smaller chips that would be packaged tightly together to work like one electronic brain.

The concept, sometimes called chiplets, caught on in a big way, with AMD, Apple, Amazon, Tesla, IBM and Intel introducing such products. Chiplets rapidly gained traction because smaller chips are cheaper to make, while bundles of them can top the performance of any single slice of silicon.

Packaging is where the action is going to be,” said Subramanian Iyer, a professor of electrical and computer engineering at the University of California, Los Angeles, who helped pioneer the chiplet concept. **“It’s happening because there is actually no other way.”**

Recruiting UG and graduate students with a focus on URM to research team – have been also successful with veteran REVs and REUs. In the past, have recruited 3 URM and an Asian female to BS – PhD program – all successfully got their PhDs – now in Industry

2023 - Students visiting Skybox Houston One Data Center - **Ashley Haghighi** will be an UG research student - Thank you to Allison Boen, Immersion Cooling Ambassador and Advisor for Data Centers of the future with Immersion Cooling Technologies, for arranging the visit



Ashley Haghighi

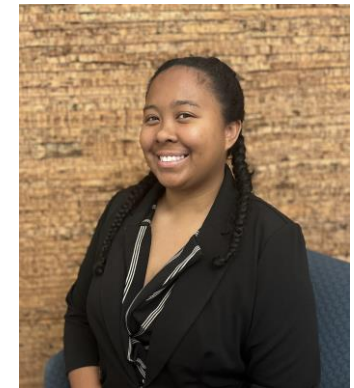
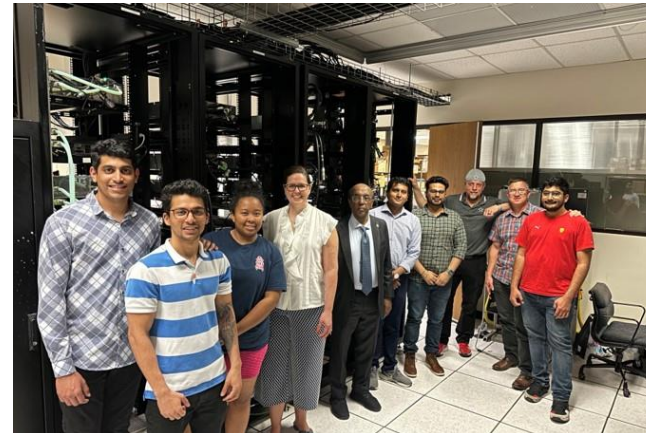
Ethan Rozak - US Marine, Currently serves - Fort Worth Naval Air Station in the reserves – NRC - UG Research Student



Chinomso (Maurice) Uneze - US Army Reserve - Combat Medic - 2016-22 – NRC, GRA



President Cowley visiting our lab - **Michelle Delk** will be an UG research student



Michelle Delk

UTA - Graduate Certificate in Electronic Packaging - Has Been a Great Venue for recruiting students including URM and Female

Mission/Purpose Statement: The purpose of the Graduate Certificate in Electronic Packaging is to provide a graduate level knowledge base in the field of Electronic Packaging with concentration on Mechanical, Material and Thermal Engineering with significant focus on modeling. Although the certificate is post graduation, undergraduate students make up 20% of the class attendance (total attendance - about 100 a semester).

Student Competencies: Upon completing the Graduate Certificate in Electronic Packaging, students will be able to:

Explain electronic packaging, from single chip to multichip, Explain electronic packaging materials, Explain electronic packaging electrical design, thermal design and mechanical design, Perform package modeling and simulation, processing considerations, reliability and testing.

Make Course contemporary – Invite guest speakers – ex

Kamal Sikka, IBM Research - Heterogeneous Packaging Integration for AI Workloads

Jan Vardaman, President, TechSearch International, Inc. – Chiplets

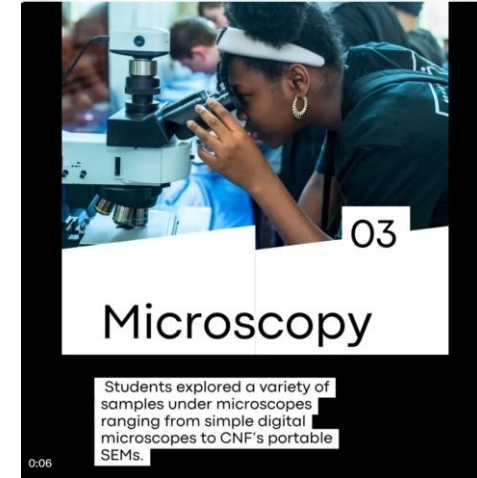
✓ Plan to broaden scope by more focus on Advanced Packaging – Heterogeneous Integration Packaging, Faculty to give modules in Silicon Photonics, ..

Chip Camp - Robert Simmons III, Micron

The Micron Foundation, the Liverpool Central School District and the Liverpool Foundation for Education wrapped up the region's first

1. Micron Chip Camp - ~120 Liverpool middle schoolers. The students spent three days of their Spring Break getting valuable hands-on experience with STEM (Science, Technology, Engineering and Math) concepts and a peek at the types of skills that will position them well for future careers in technology.
2. "We are excited to work with Liverpool CSD to give," said **Robert Simmons, head of social impact and STEM programs for the Micron Foundation**. "When we provide opportunities for young people to see what's possible and engage in hands-on learning experiences, we unlock a world of possibilities for their future. We look forward to sparking more joy, wonder and interest in STEM among students through the additional Central New York Chip Camps planned in the months ahead."

✓ *Great program to collaborate with – I plan to do that*



The Academic and Research Leadership (ARL) network

- Organized to prepare minority engineers and scientists in academia, industry, and government laboratories whose careers involve a strong focus on research. Illinois will be a sponsor this year.
- ARL symposiums include:
 - (1) faculty development - The faculty development thread hosts workshops organized by members of the ARL network that strengthen and demystify fundamental components of academia. Example topics include: Obtaining a Faculty Position, The Ins and Outs of the Tenure Process, How to Write a Successful Proposal, How to Successfully Manage a Research Group, Strategies for Diversifying your Research Funding Portfolio.
 - (2) research networking - The research networking thread provides an opportunity for seasoned researchers (university, corporate, government) to nurture connections with their peers, and be excited and inspired by the latest discoveries and technical advances across many disciplines of engineering and science.

✓ ***Great link to recruit African American graduate students, postdocs, and faculty***

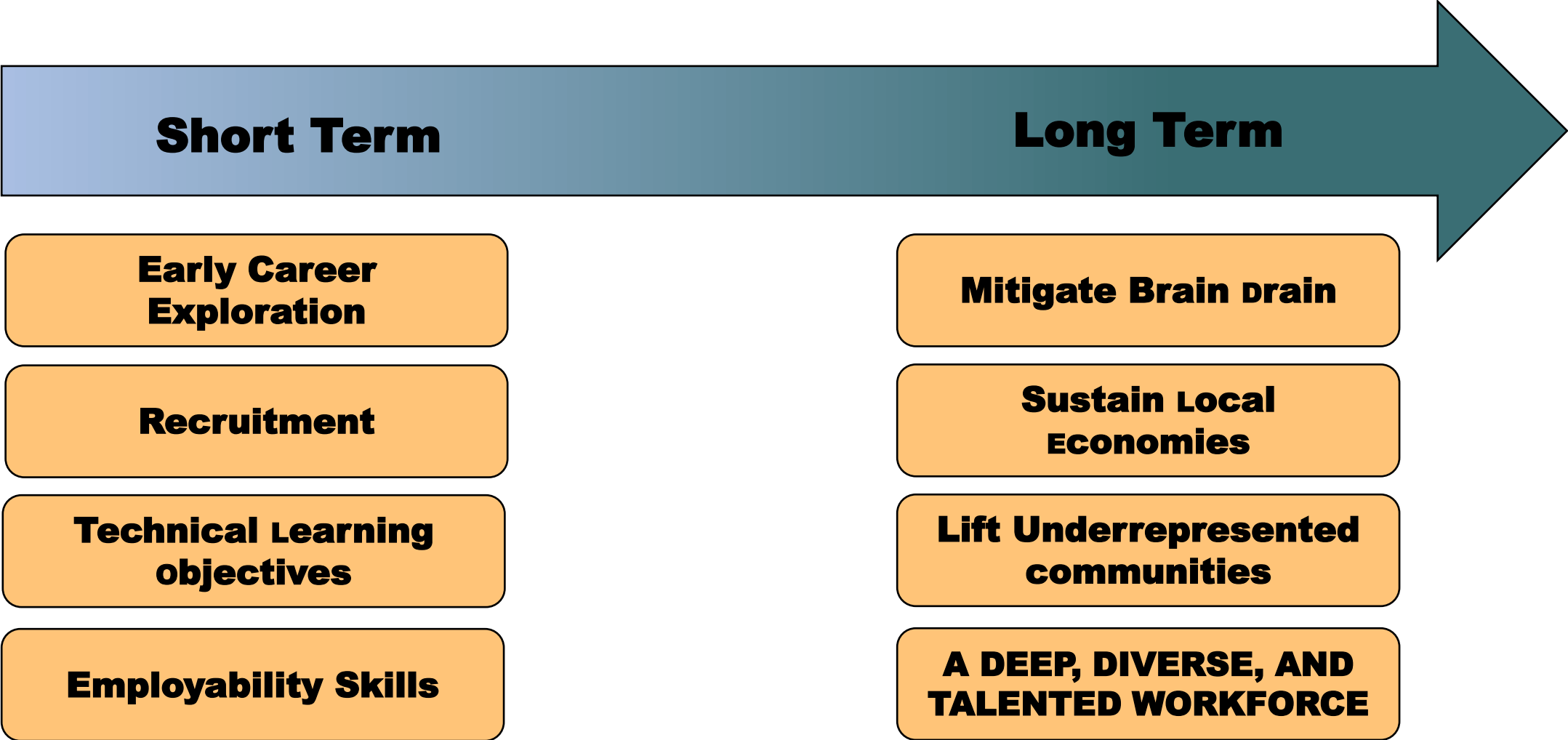
NEXTFLEX®



NEXTFLEX

**Education & Workforce Development
Programs**

WORKFORCE DEVELOPMENT OBJECTIVES



Workforce Development Strategy

NextFlex has developed a scalable strategy to secure human capital for the advanced manufacturing sector. A portfolio of four programs targets the future, emerging, and incumbent workforces with the awareness building, recruitment, skill-building, and upskilling needed to create a deep and diverse STEM talent pipeline.

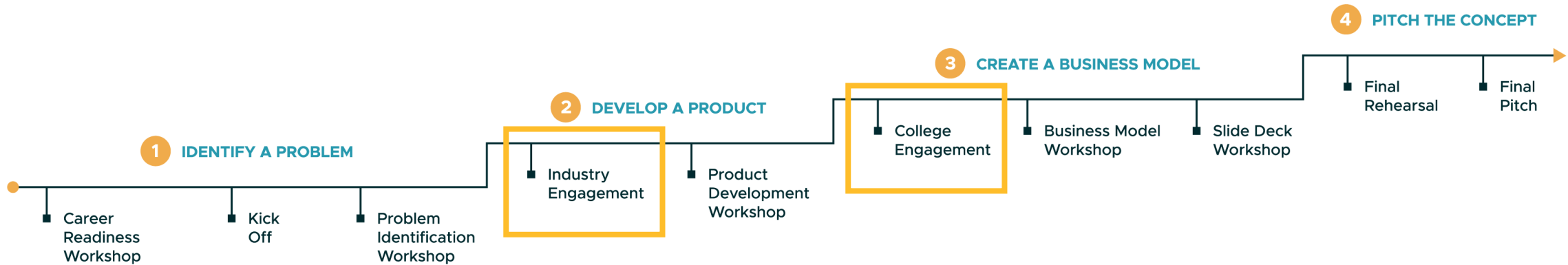


FLEXFACTOR

Designed to inform, inspire, attract, and recruit future talent for the advanced manufacturing and STEM sectors.



*“In class, we learned through reading and in FlexFactor, we learned by doing and experiencing... which was awesome.”
~ Student*



FLEXMIL

Military-connected talent bring understanding of DoD needs, work ethic, and a sense of service to the workplace.

- **Awareness of emerging technology in advanced manufacturing**
- **Career opportunities and roles**
- **Transferable skills**
- **Resume and interview tips**
- **Innovation thought process**



OVERVIEW

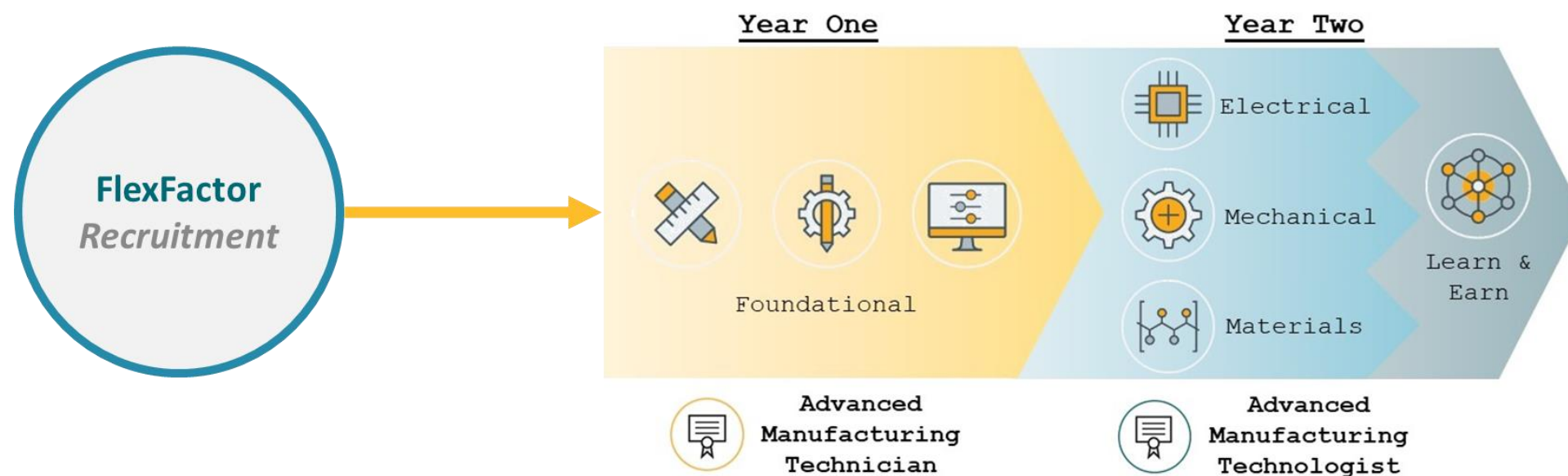
HOH Fellows Program

Harnessing the power of internships to find, evaluate, and hire the best military connected talent.

A photograph of three people standing in front of a stone wall. On the left is a woman in a blue top and dark jacket. In the middle is a man in a light blue shirt and dark pants. On the right is a man in a military camouflage uniform.

Advanced manufacturing Technology Program

In 2020 NextFlex received a \$360k National Science Foundation (NSF) Advanced Technological Education (ATE) focused on creating a new Advanced Manufacturing Technology program to recruit and train technicians in partnership with Evergreen Valley College in San Jose, CA.



Advanced manufacturing Technology Program

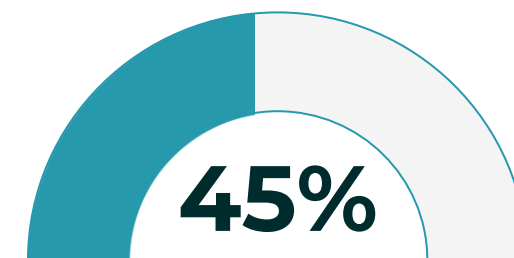
77
STUDENTS



58 EMPLOYED STUDENTS

35 NEWLY EMPLOYED

23 UPSKILLING

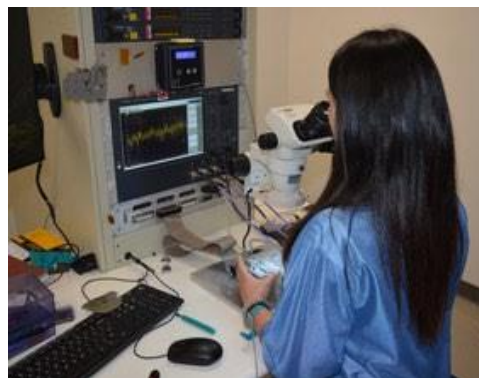


Students Employed via AMT Program

60% TRANSCRIPTED STUDENTS

35% ENROLLED IN LEARN & EARN OPPORTUNITIES

73%
STUDENTS FROM DIVERSE COMMUNITIES



FLEXPRO AND FLEXAHEAD

Through content developed by NextFlex and its membership, the programs will showcase the diverse members of industry contributing to the field and the extensive set of technological applications

The course is comprised of multiple modules that cover the topic areas listed below through the use of lectures, PowerPoint presentations, simulations, and video demonstrations to convey the critical information and learning objectives associated with each segment

- **FHE Design**
- **Materials Selection**
- **Substrate Handling & Preparation**
- **Electronics Printing**
- **Curing and Heat Treatment**
- **Post-Print Laser Processing**
- **Thinning Silicon Ics**
- **Component Attach**
- **Encapsulation**
- **Fab and Integration of Specific Components**
- **Testing and Characterization**
- **Multi-Function Tools**
- **Roll-to-Roll Processes**

FLEXPRO AND FLEXAHEAD

15 members of the NextFlex community have already contributed to the content:



- **Develop a diverse STEM workforce equipped to leverage emerging technologies to make a difference for companies, communities, and the world.**