UNIVERSITY OF OREGON
SEMICONDUCTOR WORKFORCE SUMMARY

APRIL 3, 2025

The University of Oregon (UO), home to more than 23,000 students, has long served as an agent of change and innovation. With nine schools and colleges and an interdisciplinary campus focused on accelerating scientific impact, we push the boundaries of knowledge and prepare our students for fulfilling, impactful careers and lives. Our liberal arts education fosters breadth and depth of knowledge, technical, communication, and interpersonal skills, and collaboration and adaptability—giving students a competitive edge. Our 6,000 enrolled STEM students for academic year 2023-24 are diverse, well-prepared, and multi-talented. Of our enrolled STEM students, 19% are underrepresented minorities, 58.6% are female, 26% are Pell Grant recipients, and 22% are first-generation students. We plan to continue growing the undergraduate STEM pipeline for computer science, engineering, and semiconductor pathways while maintaining strong enrollment of women and underrepresented students.

RELEVANT ACADEMIC PROGRAMS:

Oregon Pathways to Industrial Research Careers (OPIRC)

Recognizing the need to develop new and more diverse talent pipelines for STEM industries, with a special focus on the semiconductor industry, UO partnered with several Oregon community colleges to establish a program that provides financial support and mentorship for community college students interested in STEM careers.

With a **6-year, $4.3 million NSF grant**, UO launched OPIRC in 2022 to support 64 low-income community college students as they transfer to UO to pursue BS degrees in physics, chemistry, or biochemistry, followed by MS degrees through UO's Knight Campus Graduate Internship (KCGIP) program before entering careers in industrial research.

Each OPIRC scholar is eligible for:

- Up to $30K in scholarships as they pursue their bachelor's degree.
- Up to $15K in scholarships as they pursue a master's degree from the KCGIP
- Career and academic mentorship
- Community-building activities
- Professional networking opportunities

Community college partners include: Lane Community College (Eugene, OR), Central Oregon Community College (Bend, OR), and Umpqua Community College (Roseburg, OR).

A three-year, $1M grant from the Higher Education Coordinating Commission has expanded the impact and supports provided to OPIRC students, including paid research stipends so students gain hands-on experience prior to industry, increased scholarship funds beginning at the community college level, academic tutoring, corporate site visits, community building activities to support retention, and 30 additional master's-level scholarships.

Industry partners have actively contributed to the program by helping to create more hands-on learning experiences for current and prospective OPIRC students, including a clean room seminar held in the Knight Campus's Class 1000 cleanroom during spring break, and a day-long tour at a regionally-located manufacturing site to showcase career opportunities in semiconductors. A second clean room seminar will be held in Fall 2025, supported by additional industry investment.

Undergraduate Programs

Undergrad majors provide grounding in concepts and foundational learning

- Physics
  - Solid State Physics; Digital and Analog Electronics; Design of Experiments; Optics (Classical and Modern)
- Chemistry
  - Inorganic and Organic Materials Chemistry; Solid State Chemistry; Physical Chemistry
- Computer Science
  - Lower-division Core Ed Computer Science courses; new BS degree in Cybersecurity
- Data Science
  - An interdisciplinary undergraduate program where students develop skills in computational, statistical, and inferential data science with applied knowledge in one of eleven areas: Accounting Analytics, Biology, Cultural Analysis, Earth Sciences, Economics, Geography, Linguistics, Marketing Analytics, Music Technology, Physics, and Sociology.
- Access to Center for Advanced Materials Characterization (CAMCOR) equipment in undergraduate research
- Summer courses – e.g., Materials Analysis (Physics and Chem 410) – introduces undergrads to analytical tools in CAMCOR needed for characterizing materials used in semiconductors
- Labs and advanced electives provide deeper dives

Materials Science and Technology (MSTC) Degree

Leveraging existing strengths in its Chemistry and Physics departments, UO is launching an industry-aligned, research-based undergraduate program that will tie fundamental science to materials innovation.

The new **MSTC degree program** (launching in **Fall 2025**) will utilize a research-based pedagogy that includes scientific teaching practices in coursework and the integration of experiential learning though research rotations in materials science labs at UO and industry internships. With a five-year goal of 50 majors per year, the interdisciplinary program will provide a larger pool of skilled graduates ready to join the semiconductor workforce and create stronger pipelines to UO's MS and PhD programs.

Applied Master's Programs

Knight Campus Graduate Internship Program (KCGIP)

For more than 25 years, the Knight Campus Graduate Internship Program (previously known as the Masters Industrial Internship Program) has supported the nation's high-tech industry by preparing scientists for successful careers through focused coursework and labs, professional development training, and nine-month, paid industry government lab internships. The program offers five academic tracks:

- Semiconductors
- Optical Materials and Devices
- Polymer Science
- Molecular Sensors and Biotechnology
- Bioinformatics and Genomics

The KCGIP has launched the careers of over 1,300 students and helped position the UO as the nation's #1 grantor of MS degrees in physics and #5 in chemistry. The program boasts a 98% graduation rate, with over 90% of its students fully employed within three months of graduation.

Since 1998, KCGIP's Semiconductors track has graduated more than 400 scientists and engineers who have gone on to work in dozens of companies in the semiconductor industry, including Intel, Micron, HP, Microchip, Qorvo, Cree/Wolfspeed, nLight, ASML, Applied Materials, Lam Research, Form Factor, Thermo Fisher Scientific, Synopsys, and several others. Over half of students in the Optical Materials & Devices track have also found long-term careers within the semiconductor field, with employers including Intel, Analog Devices, Applied Materials, Oregon Physics, Onto Technologies, Form Factor and others.

The program maintains a dedicated 1,500+ square-foot microdevice fabrication lab space equipped with $2M worth of wafer processing and characterization tools. Recent state investments have led to new equipment to improve training and increase capacity.

Throughout the year, KCGIP industry partners engage with students through career panels and symposiums, as well as immersive project prompts, where students are given real-world research projects to address as part of their coursework. Several of the companies listed above have taken advantage of this program, presenting research problems to students, providing the necessary materials and technology, and sitting in and providing feedback on student presentations.

In 2017, the KCGIP launched an inclusion and diversity initiative to help address the lack of female and underrepresented groups in high-tech STEM fields. Through a multi-tiered approach to recruitment, retention, and mentorship, the KCGIP has increased the representation of women and underrepresented minorities in the materials science tracks by 250%. Over the last two years, these population groups represented 59% of the program's cohort.

The KCGIP has hosted new programs over the past three years to diversify recruitment pipelines and provide training opportunities through workshops. These programs, named *Launch*, have been sponsored by private and industry donors for the Bioinformatics and Semiconductor tracks.

Oregon Center for Electrochemistry (OCE)

The mission of the OCE is to educate the next generation of diverse leaders in electrochemical science and technology through a world-class program of fundamental and applied research, unique electrochemical science and engineering education and workforce training, commercialization and innovation efforts, and a network of industry, national laboratory, and academic partners.

Electroplating—a core process in creating copper interconnects and vias that link components together in integrated circuits—makes electrochemistry essential to semiconductor manufacturing. The OCE collaborates with and places master's and PhD program graduates into the semiconductor industry in Oregon and around the nation. Example companies include Moses Lake Industries, Intel, Lam Research, and HRL Laboratories.

The OCE is educating the next generation of leaders in electrochemical science and technology through:

- Accelerated coursework that includes fundamental and applied research, team-based lab work, and immersive electrochemical science and engineering
- Professional development trainings
- Paid internship in industry or national laboratories

Advanced Materials Analysis and Characterization (AMAC)

The AMAC is a 15-month applied MS program in chemistry housed in UO's Center for Advanced Materials Characterization in Oregon (CAMCOR), UO's full-service materials characterization facility featuring over $30 million in advanced research instrumentation. Students receive hands-on training in:

- Transmission Electron Microscopy (TEM)
- SEM-FIB Microscopy (DB-FIB)
- X-ray Photoelectron Spectroscopy (XPS)
- Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS)
- Electron Probe Micro Analyzer (EPMA)
- Nuclear Magnetic Resonance (NMR)
- Electronics and Vacuum Systems (troubleshooting systems)

Following a model similar to KCGIP, AMAC students complete their degrees while in industry internships. Typical careers for AMAC students in the semiconductor industry include failure analysis, low-yield analysis, service engineering, applications engineering, lab management, and R&D engineers.

Quantum Technology Master's Internship Program

Launched as a pilot program in Fall 2024, the Quantum Technology Master's Internship Program provides students with direct, hands-on skills training with common research tools used in quantum technology labs, including:

- Microwave test equipment
- Nanofabrication
- Cryogenics
- Atomic and Optical setups/experiments

It is the first Quantum MS program to focus on experimental skills by giving students access to world-class instrumentation and focusing on factorial design and design of experiments.

Courses include Nanofabrication, RF Equipment and Qubit Measurement, Quantum Computing, Cryogenic Quantum labs, Optical Quantum Labs, and advanced projects pitched by industry partners.

PhD Programs

UO is home to over 48 doctoral programs and more than 30 research institutes and centers. UO's PhD programs—particulary those with focuses on **Chemistry and Physics of Materials, Neural Engineering, Physics, Photonics, High-Performance Computing, and Artificial Intelligence/Machine Learning**—have long provided top research talent to semiconductor companies.

UO PhD programs have a strong focus on professional development recognized by training grants from the National Science Foundation, National Institutes of Health, and the Department of Education.

Doctoral Internship Program

Along with professional development training and courses, PhD students in chemistry and physics of materials have opportunities to intern at companies and national labs for extended periods agreed upon with their faculty lead. Intel, as an example, has hosted several PhD interns at its Hillsboro site.