



## Elizabeth City State University Capability Statement

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### OVERVIEW

Elizabeth City State University is an HBCU located adjacent to US Coast Guard Base Elizabeth City and Naval Station Norfolk, VA. It is a constitute institution of the University of North Carolina System offering baccalaureate, professional, and master's degrees for a diverse student body. Our mission is to promote economic, social, and environmental progress for the people of northeastern North Carolina, the state, and the nation. We achieve our commitment to the highest quality education by maintaining a rigorous focus on academic excellence through liberal arts programs and using innovative and flexible technology-based instruction models to enhance our signature areas: integrating technology with education, improving human health and wellness, and advancing the natural and aviation sciences. Through teaching, research, and community engagement, the institution's rich heritage and its current multicultural student-centered focus provide a firm foundation for its endeavors. It serves the needs and aspirations of individuals and society; producing graduates for leadership roles and life-long learning.

### RESEARCH CAPABILITIES

**Renewable Energy:** Development of electro-chemical energy storage systems (e.g. metal-ion and metal-air batteries) and energy conversion system (e.g. CO<sub>2</sub>-to-fuel production, green hydrogen production via water splitting reaction), design, synthesis, and characterization of advanced materials for energy-related applications, nanomaterial-based biomarker sensors. Laboratory curriculum design and implementation of renewable energy technologies for electric and heat energy generation. ECSU offers the following renewable energy curricula: RE Technologies, PV Solar System, Wind and Hydro Power Systems, and Introduction to Bioenergy courses.

**Natural Sciences, Pharmacy and Health Professions:** Marine and Coastal Research, Synthetic Biology, Cell & Molecular Biology (Animal & Plant), Microbiology, Parasitology, Biochemistry, Histology, Enzyme Purification, Antiviral Agents, Organic & Medicinal Chemistry, Micro and Nano-electronics for Harsh Environment Application, Kinesiology

**Aviation Science:** Aviation Science, Unmanned Aerial Systems, Human Factors, Air Traffic Management, UAS Integration in National Airspace System Simulation and Testing, Materials for Energy Systems, Instrumentation, Control, and Data Acquisition Systems, Embedded System Design & Sensor Fusion, Reverse Engineering and Finite Element Analysis Design Optimization

**Mathematics, Computer Science, and Technology:** Remote Sensing, Geographical Information Systems (GIS), Mathematical Modeling & Computational Methods, Computer-aided Design and Computer-aided Engineering, artificial intelligence.

**Health Disparities:** Mental health, obesity, suicide prevention, nutrition

**Emergency Management:** Disaster Management, Disaster Recovery, Resiliency, Economic Sustainability, Business Resiliency

## **FACILITIES**

**STEM Complex** -Home to the new Unmanned Aircraft Systems Program and the only four-year degree Aviation Science Program in North Carolina, this state-of-the-art facility has become ECSU's epicenter for research and innovation. In this 52,000 square foot glass complex, faculty and students are charting the course for the future of aviation. The STEM Complex houses the Department of Health and Human Studies, the Department of Aviation and Emergency Management, flight simulators, a drone lab, two Air Traffic Control Labs, a Pharmaceutical Compounding Lab and other research labs. Aviation Science, ECSU's signature program, currently has a fleet that boasts 11 fixed-wing aircraft and one gyrocopter, and continues to grow with support from external sponsors.

**NASA Aerospace Education Laboratory (AEL)** – Funded through grants received from NASA and the Golden LEAF Foundation, this lab houses multiple desktop flight simulator stations, renewable energy station (solar panels, wind turbines), hand-held data loggers, aircraft/rocket design stations, wind tunnel, flow-visualization tunnel, weather stations, 3D printers, mobile robotic stations (ground and aerial), and experimental setups to cover various course topics related to STEM education.

**ECSU Khan Planetarium** - The mission of the Khan Planetarium is to serve as a community outreach program and academic support unit that provides educational programming (PK-College level) to ECSU students and faculty, regional schools and the community at-large. The planetarium received funding from the Department of Defense for remodeling and installation of digital upgrades.

**Center for Remote Sensing Education and Research (CERSER)** – Develops and implements innovative and relevant education and research collaborators focused on ice sheet, coastal, ocean, and marine research. The CERSER Laboratory consists of computer workstations on Macintosh, Linux, and Windows platforms; remote storage areas of polar data; servers including a local web server and file server. CERSER operates a Sea Pro Model 210 research vessel with UHF Radio, Raytheon 300 GPS and Raytheon 365 Depth Finder. The vessel utilizes an Imagenex SportScan dual channel, high-resolution, digital sidescan sonar with a 23 meter tow cable. For land research, CERSER utilizes a SIR-3000 Ground Penetrating Radar by Geophysical Survey Systems, Inc. The SIR-3000 is a small, lightweight system designed for single user operation and incorporates advanced signal processing and display capability for in-the-field 3D imaging.

**Science Gateways Community Institute (SGCI)** – NSF-funded, online and in-person resources and services. The goal is to allow science & engineering communities to access shared data, software, computing services, instruments, educational materials, and other resources specific to their disciplines. Institute activities include a 4-week coding institute, hackathon, internships, and young professional program.

**ECSU NASA Mobile STEM Lab** – The mobile lab offers regional schools the opportunity to present science to students who might not otherwise have resources for advanced technology. The lab consists of 10 stations designed to offer student the opportunity to experience cutting edge technology firsthand. The stations cover aviation, technology, robotics, and more.

**Major & Specialized Instrumentation** - Digital Starlab Saturn Package 120V model with Dome, Aviation learning lab, Robotic Faro Arm, Q-Ball Experimental Quadcopter

**NanoSensors and Solar Fuels Laboratory (NSFL)** – NSFL is a part of material research facility at ECSU. Funded through grants received from DoN and NSF, this lab houses multiple advanced instruments including differential electrochemical mass spectroscopy (DEMS), gas chromatography, high voltage appliance potentiostats with electrochemical impedance spectroscopy, electrochemical cells, sonicator, OVG-4 gas generator, Keithley voltage instrument with 10 channel and other standard laboratory experimental accessories (hot plate, soldering system etc.) to cover various course topics related to STEM education.

**UAS Drone Classroom**—The 1,026 square foot classroom is the latest advancement in ECSU's nationally recognized UAS program. Complementing the institution's 250 ft by 100 ft drone flight pavilion; providing students with a real-world outdoor training environment. ECSU is the only four-year institution in North Carolina authorized by the FAA to offer a degree in unmanned aircraft systems. This complex supports student learning and workforce development in civilian and commercial drone operations.

## **PAST PERFORMANCE**

The National Institute of Justice (NIJ) on research aviation options to help the African nation of Kenya combat illegal poaching in its parks and services. The Department of Homeland Security (DHS) to conduct a series of remote sensing and GIS projects in Coastal Hazards and Maritime Environment Security and to study Mental Health Effects of Hurricanes

in Coastal North Carolina. The National Science Foundation (NSF) to establish the Science Gateways Community Institute (SGCI) a multi-institutional group focused on expanding the capabilities, number and sustainability of science gateways, led by the San Diego Supercomputer Center at the University of California San Diego. The NSF for Acquisition of Differential Electrochemical Mass Spectrometry for Investigation of Different Electrochemical Reaction Kinetics on Nanostructured Catalysts and Targeted Infusion Project: Stem: PipeLine for Plant Sciences. The Department of the Navy (DoN) to establish a Materials Research Center to promote basic and applied science research as well as collaborative and innovative research training in areas relevant to the DoD. The Army Research Office (ARO) instrumentation grant will enable ECSU to acquire equipment to be used to investigate the impact of samples size, shapes and edge terminations on the Semiconductor-Metal Transition (SMT) characteristics of thermochromic Vanadium Dioxide (VO<sub>2</sub>) thin films. The National Institutes of Health Institute of General Medical Sciences (NIGMS) supports ECSU's Minority Access to Research Careers Undergraduate Student Training in Academic Research Program (MARC USTAR). The MARC grant supports student research training, increased academic support, and promotes student success in the area of biomedical science, with the focus on a doctorate degree. The NSF provided a grant to integrate Python programming into the Social Sciences to increase critical thinking, boost STEM readiness, and improve recruitment and retention among social science majors by embedding programming skills. The FAA has also given aid to boost the Aviation Workforce Development Academy to prepare high school students to become pilots, aerospace engineers, or drone operators. The Department of Homeland Security has also provided funding to enhance local communities' capabilities to prevent targeted violence and terrorism with ECSU's focus being on youth-targeted violence prevention.