

A Brief Description of Research and Education Programs at Binghamton University, State University of New York (SUNY)

Founded in 1946, Binghamton University (BU), also known as the State University of New York (SUNY) at Binghamton, is one of the premier public research universities. According to *U.S. News & World Report*, BU ranks 32th among a list of top public schools. The university comprises seven schools and colleges with a combined undergraduate and graduate student population of approximately 17,309 students. The University is focused on expanding research and graduate training across all areas of the university. To aid in this growth, the faculty have guided the creation of six transdisciplinary areas of excellence (TAE) that bring together diverse teams of researchers to address critical social, scientific, technological, cultural, and economic issues. These areas include health sciences; smart energy; data science; sustainable communities; citizenship, rights, and cultural belonging; and material and visual worlds.

As a national research university, BU has a well-established research infrastructure to support the training and research activities of undergraduate and graduate students, as well as post-doctorate researchers. BU's Thomas J. Watson School of Engineering and Applied Sciences (Watson School) consist of five departments, including the Department of Biomedical Engineering, Department of Mechanical Engineering, Department of Computer Science, Department of Electrical and Computer Engineering, and Department of System Science and Industrial Engineering. The Watson School is also the home for various research centers, including the Center of Biomanufacturing for Regenerative Medicine (CBRM), Small Scale Systems Integration and Packaging Center (S3IP), the Center for Advanced Microelectronics Manufacturing (Camm), the Center for Autonomous Solar Power (CASP), the Center for Energy-Smart Electronic Systems (ES2), the Integrated Electronics Engineering Center (IEEC), and the Watson Institute for Systems Excellence (WISE). We offer doctoral, MS, and undergraduate degrees in Biomedical Engineering, Mechanical Engineering, Computer Science, Computer Engineering, Electrical Engineering, Materials Science and Engineering, and Systems Science and Engineering. In addition, we offer a MS degree in Healthcare Systems Engineering.

Select research areas representing Binghamton's cutting-edge R&D activities in life science, biomedical research, nanomedicine, materials sciences, stem cell and regenerative medicine, biomedical devices, sensing, imaging, organ-on-chips, biomechanics include:

- Advanced cell manufacturing, tissue biofabrication, bioreactor automation, standardization, tissue and biomaterials foundry
- 3D bioprinting, tissue organoid development, and tissue vascularization
- iPSC-derived organ transplantation
- Organ-on-a-chip, stem cell, and regenerative medicine
- Cancer immunotherapy, cancer vaccine development, and cancer biomarker and early detection
- Targeted and controlled drug delivery for cancer treatment
- Point-of-care (POC) and point-of-test (POT) system development and wireless wearable biosensors
- Multi-scale tissue constructs, bioreactor automation and standardization
- Microfluidics and multiphase flow, additive manufacturing, and 3D printer fabrication
- Bioelectronics, microsystems, lap chip manufacturing, and bioelectronics
- Nanomanufacturing, physics and characterization of soft materials
- Chemistry and biochemistry of nucleic acids, elucidation of RNA structure and function
- Chemo- and radio-therapeutics and cancer early detection
- Nanomechanics, 1D and 2D nanostructures, nanoscale adhesion and interfaces, nanocomposites, bio-inspired complex and hybrid nano-systems, and nanoelectromechanical systems (NEMS).
- Raman and multiphoton microscopic technologies for imaging of living systems to improve understanding, diagnosis and interventions of human neuro-oncologic and neurodegenerative diseases
- Nanotoxicity, nanomaterials characterization, small scale systems integration and engineering