

**NSF CREST CENTER FOR NANOTECHNOLOGY RESEARCH AND EDUCATION ENABLING DIVERSE  
WORKFORCE**

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**Abstract:** The Center for Nanotechnology Research and Education (CNRE) at the University of the District of Columbia (UDC) is supporting workforce development in the Nanotechnology area. Our center supports workforce development from the Community College(CC) to the postdoctoral level. We have supported several courses focusing on nanoscale science and technology skill sets essential to join the workforce in diverse industries for diverse students. To serve a diverse student population facing economic and insufficient prior STEM knowledge base, CNRE has adopted guided inquiry-driven experimental research as a recruitment and retention platform. CNRE engaged postdoc and graduate students to mentor Lincoln University in Missouri students to develop pathways from non-STEM HBCUs to ABET accredited Ph.D. granting HBCU(UDC). CNRE also supported ~50 UDC-CC students in the Introduction to Nanotechnology course that resulted from a prior seed NSF-ATE project. CNRE is also supporting the development of an ambitious two-year AS degree program at UDC-CC in Quantum literacy. CNRE's active research magnetic tunnel junction and molecule-based futuristic computer technology offer an excellent opportunity to provide hands-on training to UDC-CC students. Our expertise will train UDC-CC students in fabricating 1-5 nm scale tunnel junctions and molecular devices, which are directly connected to skills needed for Josephson junction and molecule Qubit-based quantum computation. CNRE strongly emphasizes developing economic experimental protocol and resource management to maintain sustainable nanotechnology research with the least operating cost. CNRE students are prepared to conduct research utilizing industrially oriented optimization techniques and operating CNRE clean rooms and equipment to reduce operating costs. CNRE students are utilizing resources that are everywhere in all the semiconductor industries and are also considered important for inventing and manufacturing quantum computer hardware, solar cells, and biomedical services. Our center is also supporting the newly developed computer engineering program in the UDC Electrical engineering department. UDC nanotechnology has produced a technologically advanced workforce for Intel, Micron, KCNSC, Lockheed Martin, Northrop Grumman, and NASA organizations.

**Bio:** Prof. Pawan Tyagi is currently leading NSF-CREST Center for Nanoscale Research and Education (CNRE). Under his leadership, CNRE is supporting UDC's new PhD program, multidisciplinary faculty, and nanotechnology skill building from high school to postdoctoral level. He is also the director of the DOE-NNSA Sponsored Consortium of Additive Manufacturing Post Processing Partnerships (AMP3). Prof Tyagi directs the AMP3 consortium comprising four HBCUs and three DOE industries to develop a diverse workforce via industry-oriented, cutting-edge research. Prof. Pawan Tyagi is actively researching to harness molecular nanostructure strength as futuristic computer device components, biochemical sensors, and renewable energy harvesting metamaterials. Prof. Tyagi has also contributed to surface improvement technologies for complex shaped metal 3D printed parts. He is also the inventor of Student Presentation-based Effective Teaching (SPET). Driven by his passion for improving diverse students' intellectual potential, he pioneered the development of Positive Intelligence training in engineering education at UDC. He conducted effective teaching workshops for >300 internal STEM faculty. Prof. Tyagi has 24 years of materials science experience, from his BS and MS in metallurgical and materials engineering at the Indian Institute of Technology (IIT), and two years of industrial experience in metal manufacturing. His doctoral study was in molecular spintronics at the University of Kentucky. Prof. Tyagi further expanded his skills with postdoctoral research in nano-microscale biomedical sensors and devices at Johns Hopkins University. He received the university-wide 2022 Excellence in Teaching Award from the UDC president and the 2020 Innovator of the year award at the BEYA STEM conference. He has more than 60 peer-reviewed publications and two US patents.