Cleveland State University (OH) $1,009,852.00
Project Title: *Developing Modeling and Simulation-Based Multidisciplinary Learning Environment for Urban Universities*

Building A Modeling and Simulation-Based Multidisciplinary Learning Environment for Capacity Transformation in Urban Universities: Sustainable Energy Systems and Beyond

SUMMARY

Mechanical engineers work in all industries. The highest concentration of mechanical engineering jobs that have experienced the fastest growth is in the energy system services sector. The pledge of President Biden and the recent passing of the $369 billion in climate and energy spending by Congress on August 7, 2022, to create a new economy empowered by clean energy is a timely driving force that creates an unprecedented demand for skilled workforce in sustainable energy systems where computer modeling and simulation are essential skillsets. Modeling and Simulation (M&S) are being increasingly used in industry for product development, system design and retrofitting, and risk assessment, and are consequently becoming a prerequisite for testing, prototyping, and commissioning. Yet, there is a shortage of M&S programs, especially in urban state universities, where diverse and underrepresented students chose to study. In responding to these needs, the Department of Mechanical Engineering at Cleveland State University (CSU), in collaboration with the Department of Electrical Engineering and Computer Science (EECS), and Department of Teacher Education, proposes to leverage the funding opportunity from Department of Education's Modeling and Simulation Program (MSP) to develop a new graduate concentration of Modeling and Simulation in Sustainable Energy Systems (MS-SES).

The proposed project goal will be accomplished via the following four tasks: (1) develop three new courses and enhance an existing project course to align with the MS-SES concentration. Under this task, the team will structure the core of the concentration for students to learn fundamentals of M&S while guided by projects in energy systems that are embedded in all courses from introductory level to application level. A new M&S lab integrating the existing VR/AR capability and high-performance computing is also to be developed to serve the core courses; (2) deliver a flexible curriculum that fits student needs for a standard or accelerated master's degree in mechanical engineering with M&S concentration, or a stand-alone M&S certificate program. Under this task, the project team will apply pedagogic changes in delivering courses. Each course is team-taught by computer science or machine-learning faculty with an energy system faculty to provide students a balance between fundamental and hands-on skills. Strategies such as flipped classroom and problem-led learning will be applied; (3) evaluate and demonstrate the best practice for an MSP program that can be adopted by other engineering tracks beyond the funding period; and (4) develop a student-centered environment to recruit diverse students and enhance their success towards the MSP concentration, demonstrating careers pathways through workshop series and symposia, and leveraging campus events.

Students will benefit from completing a degree with an MS-SES concentration in multiple ways. They will be able to demonstrate their specialized academic achievements among their peers, their decision-making abilities, and research competence in their field of study. Students will also gain expertise that allows them to contribute to new technology innovation and deployment towards a sustainable future that does not exist today. For example, industries are always facing new challenges and open-ended questions that need efficient turn-around time. Those challenges cannot be addressed using traditional knowledge bases and experimental approaches. Most importantly, having a graduate degree with modeling and simulation concentration will unlock career opportunities in a range of industries from manufacturing to healthcare, as well as federal and state governments, where mechanical engineering graduates are needed. Finally, the successful completion of the proposed project will enhance the institutional capacity in academic advancement and knowledge creation in state-of-the-art technology and provide a model for developing graduate-level modeling and simulation programs in other disciplines within our institution and nationwide.

Inter American University of Puerto Rico San German Campus (PR) $ 864,053.00
Project Title: *Modeling and Simulation Trough Education and Research Workforce Program (MASTER Workforce) at Inter American University of Puerto Rico*

Modeling And Simulation Through Education and Research Workforce Program (MASTER Workforce) at Inter American University of Puerto Rico

A workforce development in Modeling and Simulation (M&S) is proposed by Inter American University of Puerto Rico, San Germán (SGC) and Bayamón Campuses (BYC), consisting of four main developments: 1) a new M&S online professional certificate program, 2) a minor undergraduate concentration in M&S, 3) workforce improvement in M& through community building activities as the Summer Institute and REU, and 4) a master template for M&S research infrastructure that documents program activities, hurdles, and successes for replication at other campuses/institutions and program scalability. The project aims to provide the best STEM education through the application of M&S in courses and research in sciences, engineering, and mathematics careers, using technology and establishing two new programs that will pursue this goal by improving work skills of students and professionals. The project builds on a previous successful collaborative proposal that used interdisciplinary faculty and speakers from multiple institutions for professional development activities, research, and project-based learning during an intensive Summer Institute. The design and evidence-based best practices obtained will continue to grow during academic year, building a community of faculty and students around M&S. Simulations and modeling using computational tools requires sound mathematical and interdisciplinary knowledge that promotes analytical and communication skills for workforce development, addressing the need of more and better STEM education for the future of the nation and particularly underrepresented groups, with the goal of online accessibility that benefits the nationwide professional community.

DEWEY
UNIVERSITY

Dewey University (PR) $866,249.95
Project Title: A*wareness of the Development and Promotion of Success in Learning through the Study and Implementation of a Modeling Program, Virtual Environments and Simulation (VirtualEd-MES)*

ABSTRACT

Applicant: Dewey University-Carolina; (Online Division)
11170 Ave. 65 de Infantería, Carolina, PR 00968 |
Contact: Prof. Yosanalis Torres Hernández, (787) 603-4095, yosanalis.torres@dewey.edu

Proposed Project: Awareness of the Development and Promotion of Success in Learning through the Study and Implementation of a Modeling Program, Virtual Environments and Simulations (VirtualED-MES)

Institution / Target Area / Population Served: Dewey University is a private, nonprofit, Hispanic-Serving Institution located in Puerto Rico. This institution provides educational opportunities for students across Puerto Rico, through blended learning modalities under its *Online Division*. This Division's main facility is currently located at Dewey University, Carolina and serves the 4 educational centers attending academic sessions for the entire population. With 100% Hispanic, 100% Pell grant eligible (low-income) population, an average age distribution of 25-29, and 82% of women primarily, DU actual enrollment is 1,157 students (Fall 2022) of which, according to the admission application system, 80% prefer to study through the online division. Puerto Rico's near-term economic performance is overshadowed by a large cloud of uncertainty as the Island tries to address the COVID-19 pandemic, Hurricane Maria, and the central government's bankruptcy, in addition to unemployment rate 6.4% (June 2022). Taking this into consideration, it is safe to say that post-secondary education represents an economic opportunity not only for personal growth, but also for social growth, much needed at this time.

Project Activities and Services: DU-Carolina; (Online Division) proposes the following activities and services:
(1) *Promote the study and awareness of Modeling and Simulation.*
(2) *Develop New Academic Program*
(3) *Enhance existing programs through simulation labs*

Goals and Expected Outcomes: The project's overarching goals are to Promote the study, Develop and **Establish a certificate program** and **complement existing courses through modeling, virtual environments and simulation** strategies. **Raise awareness of Modeling and Simulation** as learning success strategies, and

Absolute Priorities and Competitive Preference Priority: The proposed project responds to Absolute Priority 2; *Establishing Modeling and Simulation Programs* and also to Competitive Preference Priority 2 - *Promoting Equity a Student Access to Educational Resources and Opportunities*. The study used to support the evidence requirement:
Acuña, M. (2019, 08 30). *Aprendizaje Inmersivo: aplicando la realidad virtual en el aula.* https://www.evirtualplus.com/aprendizaje-inmersivo-realidad-virtual-aula/#%C2%BFQue_es_el_aprendizaje_inmersivo

Year 1 Budget Request: DU-C requests $288,750.00 for Year 1 of this MSP Program, the first MSP application ever undertaken by Dewey University-Carolina, Online Division.