

FY21 Modeling and Simulation Program
Absolute Priority 2 – Establishing Grants

P116S210002 – Savannah State University, SC

Project Title: Creating Access to Modeling and Simulation Education for Minorities and Women

Abstract:

The primary goal of this proposal is to design and implement a modeling and simulation degree track in its CST degree program for students who wish to concentrate and develop strong skills in modeling and simulation for various applications which falls under Absolute Priority 2 (Establishing Modeling and Simulation Programs). The project will also provide modeling and simulation courses for non-STEM majors who wish to apply modeling and simulation knowledge in their respective fields. Minority and women students majoring in engineering, economics, management, living systems, biomedical engineering, ecology, environment, and other STEM students will have the opportunity to obtain a certificate, or minor in Modeling and Simulation.

Modeling and Simulation (M&S) is the science composed by the theoretical-computational framework devoted to the use of models to characterize, describe, predict, mimic, replicate a system, phenomenon, or process. M&S can even become a tool that more realistically forecasts a prediction compared to a traditional experiment, while M&S allows the free roaming of input environmental variables of the physical phenomenon beyond the constraints of the experimental model. In some cases, even providing the real experiment is impossible or not feasible, and therefore M&S acquires immense importance. Including underrepresented minorities and women in the pool of experts will greatly improve our chances of winning the battle for better modelling the real world. This application is to request funding for Savannah State University (SSU) to contribute to the effort by producing such vitally needed minority and women scientists. SSU will support 25% matching cost with the committed effort of the PD, CO-PD, and other senior personnel, and also with the computational resources of 4 computer labs already in place, housing 20 computers each plus simulation software licenses (Bentley Suite, Matlab etc.). Each year two faculty members of SSU will attend three annual task force meetings to be held in Washington, DC. Instructional materials will be prepared in an audio format to ensure that instructional materials are available for all individual with any type of disability, and with the help from office of the Disability Resource Center of SSU equal access will be ensured for students with any type of disabilities. New equipment will be purchased for students having disabilities. Project activities will expand access to modeling and simulation /computer science education for minorities and women.

The intellectual merit of the proposed project lies in the academic courses that will be developed and delivered, and in the variety and quality of knowledge and skills that the beneficiary students will gain. The degree program (Modeling and Simulation track) will focus mostly on computer simulation but will include other courses that will give the students a balanced understanding of the topic. Students will learn about the discrete nature of computation and possible errors. They will learn about different M&S methods and can recommend appropriate solutions. They will understand the difference between exploration and optimization applications. Students will know

the difference between credibility, resolution, and fidelity and knows how they relate to validation and verification. The project will produce a degree program qualified to seek National Center for Simulation (NCS), and National Training & Simulation Association (NTSA) certifications.

Graduates of these programs will learn the programming languages, software, and mathematics required for developing simulation model for different applications. Furthermore, M&S has the power to facilitate the understanding of a phenomenon without the need to physically mount and test it a priori, which translates into considerable savings in time and money. Therefore, there is a need for modeling and simulation literacy among the citizenry to develop better model of the real world. Accordingly, expected outcomes and broader impacts of the proposed project would be (a) establish a modeling and simulation program that ensures accessibility for students with disabilities; (b) design and implement a modeling and simulation degree track in its CST degree program and increase the number of minorities and women graduates in the United States that understand the methods and algorithms for design, validation, verification, and solution; (c) an increase in the number of minorities and women professionals in our country who can perform simulation of real environments and systems for high-performance computing, parallel computing, distributed computing and/or computer networks that can be presented and published at MSP taskforce meeting in Washington DC and other conferences and journals; (d) an increase in the number of minorities and women professionals who can develop tool that more realistically forecasts a prediction compared to a traditional experiment; and (e) increase in modeling and simulation literacy in the society at-large. Furthermore, since Savannah State University would be one of the few that offers a degree program in modeling and simulation, this project will contribute immensely to the diversification of the nation's modeling and simulation workforce.

P116S210004 - The University of Texas at El Paso

Project Title: A Developing Modeling and Simulation based Engineering Learning Environment for Capacity Transformation (M-SELECT) in Higher Education

Abstract:

In today's tech-savvy industries, the nature of work is changing due to technological advances and rapidly evolving supply chains and customer needs. Employers, nowadays, expect their workforce to have skills and competencies with state-of-the-art technologies. Obviously, the future generation needs be smarter, more innovative, technologically sound, and efficient to cope with an entirely new environment of industries. One specific requirement imposed by today's industries is knowledge and skillsets in computer modeling and simulation (M&S).

M&S is being increasingly used in many industries to understand the root cause of product deviations, to reduce scrap rates and tackle quality issues, while making sure the machines are utilized at full potential, and to increase overall operational excellence. In response to these needs, the Department of Industrial Manufacturing and Systems Engineering (IMSE) at The University of Texas at El Paso (UTEP) in collaboration with Mathematical Science (MS) and Educational Leadership and Foundation (EDLF) Departments, wants to leverage the funding opportunity solicited by Modeling and Simulation Program (MSP) from the Department of Education (DoEd) to develop a new concentration in Systems Modeling and Simulation (SMS).

To attain the goal, this project has identified four key activities: 1) adjusting the existing curriculum of the IMSE Department and developing a program plan to establish the SMS concentration. Under this activity, the project PD and Co-PDs will restructure two existing courses aligning them with the modeling and simulation program. The project also plans to develop two new courses on augmented reality (AR) and virtual reality (VR) based simulation and Machine Learning (ML) for Systems Emulation; 2) developing a Systems Innovation Modeling and Simulations (SIMS) laboratory to stimulate students' interest in hands-on skillset development in this field of study and to add innovation to M&S research-based projects; 3) applying appropriate teaching and learning pedagogy to integrate the newly developed course and lab activities into the existing curricula; and 4) student centering towards the SMS concentration through constructive practices such as enhancing student career pathway support systems, arranging a technical leadership workshop series and symposia during the award years.

Pursuing an academic degree with SMS concentration will bring three-fold benefits to the students. First, the students having a concentration in modeling and simulation will be able to demonstrate specialized academic achievement, intellectual leadership abilities, and research competence in this field of study. Second, students will gain expertise to contribute to innovation and development of relevant knowledge and practices. As a matter of fact, industries are always facing new kinds of challenges and problems such as constantly changing customers' demand and preference. These challenges cannot be addressed using traditional knowledge. Here, having a special concentration can play a critical role by helping the industries develop a solution approach. Finally, having a graduate degree with SMS concentration will unlock many career opportunities in the industry, federal and state governments, and their partners in defense and healthcare. In addition, the successful completion of this project will enhance the institutional capacity in academic advancement and knowledge discovery in state-of-the-art technology.