Workshop: Milestones-Based Structured Active Learning Approach to Improve Student Performance in Engineering Courses

Dr. Ashish D Borgaonkar, New Jersey Institute of Technology

Dr. Ashish Borgaonkar works as an Assistant Professor of Engineering Education at the New Jersey Institute of Technology's (NJIT) Newark College of Engineering (NCE) located in Newark, New Jersey. He has developed and taught several engineering courses primarily in first-year engineering, civil and environmental engineering, and general engineering. He has won several awards for excellence in instruction; most recently the Saul K. Fenster Award for Innovation in Engineering Education. His research focuses on increasing diversity in STEM education and the STEM workforce. He has received multiple grants to run workforce development training programs as well as undergraduate research experience programs to train underrepresented minority and first-generation students. He is the Founding Director of NJIT's Grand Challenges Scholars Program. He also has worked on several research projects, programs, and initiatives to help students bridge the gap between high school and college as well as to prepare students for the rigors of mathematics. He is also involved in various engineering education initiatives focusing on the integration of novel technologies into the engineering classroom, and excellence in instruction. His additional research interests include water, and wastewater treatment, stormwater management and pollution control, civil engineering infrastructure, and transportation engineering.

Dr. Jaskirat Sodhi, New Jersey Institute of Technology

Dr. Jaskirat Sodhi is interested in first-year engineering curriculum design and recruitment, retention and success of engineering students. He is the coordinator of ENGR101, an application-oriented course for engineering students placed in pre-calculus courses. He has also developed and co-teaches the Fundamentals of Engineering Design course that includes a wide spectra of activities to teach general engineering students the basics of engineering design using a hands-on approach which is also engaging and fun. He is an Institute for Teaching Excellence Fellow at NJIT and the recipient of NJIT's 2022 Excellence in Teaching Award - Lower Division Undergraduate Instruction, 2022 Newark College of Engineering Excellence in Teaching Award, and 2018 Saul K. Fenster Innovation in Engineering Education Award.

Prof. Lucie Tchouassi, New Jersey Institute of Technology

FYEE 2024 - Workshop

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Workshop Facilitators:

- Dr. Ashish D. Borgaonkar (Assistant Professor, NJIT)
- Mrs. Lucie Tchouassi (Associate Dean, Newark College of Engineering, NJIT)
- Dr. Jaskirat Sodhi (Senior University Lecturer, NJIT)

Workshop Overview:

This workshop will present a milestones-based approach to enhance key learning modules in engineering courses to improve student engagement, participation, and performance. This idea will provide a guided-inquiry-based structured approach to delivering key learning modules and the assignments, projects, or other deliverables linked to them. The basic idea is to redesign the delivery aspect of learning modules to allow for one or more in-class activities where students can review, discuss, and work on getting started and completing at least some portion of the major linked deliverable for the topic. Through the activity, students will be encouraged to reach a meaningful milestone toward completing the full assignment or project. This approach guarantees that all in attendance have at least started working on the deliverable and have a clear idea and understanding of what needs to be done. Instructors and support staff are available to answer any questions or to provide further clarification. The authors have piloted this approach in a multidisciplinary first-year engineering design course and have observed a significant increase in student participation, engagement, and performance. This approach does require some advanced planning and redesigning of lesson plans but also provides an added structure to the course.

This workshop will be an engaging session of two parts. In the first half, presenters will go over the basic idea and a couple of examples of how some modules were updated based on this approach and the second half will invite participants to work in groups to identify some of their modules and to design a milestone-based activity around them. All participants will walk away with ideas and action plans based on this approach for immediate implementation in their courses.

This session will be beneficial for those interested in Excellence in Teaching, Active Learning, Student Engagement, and Broadening Participation in Engineering and Engineering Technology.

Workshop Breakdown:

- Introductions - 10 minutes
- Overview of the Milestones-Based Approach to Delivery of Key Learning Modules in Engineering Courses - 35 minutes
- Group Exercise - Design Your Own Milestones for a Challenging Learning Module in Your Course - 30 minutes
- Report Back - 10 minutes
- Closing - 5 minutes