



TUEE Collaboratory
*Transforming Undergraduate Education
in Engineering (TUEE)*

**Proposed Comprehensive Model Pilot for Transforming
Undergraduate Education in Engineering (TUEE)
*Student-Centered Professional Practice Learning (SCPPL) Initiative
in Computer Science and Engineering for AY 2023-24***
Summary January 2, 2023

The emerging national movement to transform undergraduate education in engineering (TUEE) requires a radical shift from passive learning, four years of traditional classroom lectures and job fairs, to empowering student-centered, pro-active, multidisciplinary, active learning typified by team-based, open-ended problem solving and project learning involving real-world situations, often with real customers and real potential employers, *throughout* the undergraduate experience. All access, diversity and inclusion issues must be addressed systematically as well and embedded from the outset.

Curricular changes, including [ASEE TUEE](#) study findings and recommendations, dominate the many transformation initiatives currently underway nationally. However, the proposed Transforming Undergraduate Engineering Education (TUEE) Collaboratory model integrates Curricular, Co-curricular (especially professional skills development such as team work, presentations, reports and project management), Diversity/Inclusion and new standards for higher education/industry partnering into a comprehensive systemic model of student-centered active learning.

The model is structured on an autonomous “Academic Skunkworks” operating environment flexible framework comprised of four Action Councils with membership from all program participants. These Action Councils are: the Faculty Professional Practices Council (FPPC), the Student Professional Practices Council (SPPC), the Student Diversity Solutions Council (SDSC) and the Executive Council (EC).

During the 2023 spring semester pilot start-up and development phase, an autonomous “Academic Skunkworks” operating environment would be established as a precursor for a center or institute to facilitate collaboration by the partner constituencies noted below. By mid-May 2023, the flexible framework, i.e., the four Action Councils, would be created and established in preparation for the comprehensive pilot to be implemented for AY 2023-24. A diverse cohort of about 50 high potential students, about 10 Strategic Corporate Partners (SCPs) and appropriate campus faculty and staff would be established by early June 2023 and prepared to implement the comprehensive pilot throughout AY 2023-24.

All currently scheduled courses, student programs and events throughout THE UNIVERSITY should be carried out as planned through June 2024 while the comprehensive pilot is being developed, and then implemented, in the autonomous “Academic Skunkworks” environment.

The project will require only minimal time commitment of faculty and staff through the 2023 spring semester development phase.

When the 2023-24 academic year begins, acting as partners, the Councils would collaborate with SCP professionals in designing and developing student-centered, active learning programs, projects, events, and activities while establishing new partnering standards for higher education/industry collaboration. Students would be empowered throughout all the undergraduate years to engage with practicing professionals in proactive curricular and co-curricular learning. The new partnering relationships would include the extensive involvement of alums and recent retirees (industry and professional societies) in a variety of roles to supplement and complement current faculty, who are typically operating with a full plate teaching theory and conducting research.

The short-term objective of the initiative is to develop and implement the small comprehensive pilot for a replicable, scalable and sustainable exemplar model of engineering practice at THE UNIVERSITY consistent with the ASEE TUEE findings and recommendations released in 2018. The implementation would include:

1. ***Undergraduate Professional Practice Program (UPPP)*** an exemplar program featuring student centered team-based problem solving and project learning each year throughout the undergraduate experience. The Faculty Professional Practice Council (FPPC) in collaboration with SCP representatives on the Industry Innovation Board would be responsible for overseeing the overall academic experience for all undergraduate engineering/computing students. Included would be a design spine with at least one signature team-based sponsored project each of the four years with design thinking and entrepreneurial mindset integrated throughout. Also included will be a *sponsored senior design (capstone) program featuring real problems that would be solved by small student teams for at least eight sponsors/customers. Best practice Industry Sponsored Third-Year Design Projects would be introduced in spring semester 2024 with sponsored second-year projects being introduced spring semester 2025.* Various presentations and reports would be embedded with each project to help assure that each student acquires the oral and written communication skills required in the professional workplace upon graduation.
2. ***Student Professional Practice Scholars (SPPS)*** – a unique program managed by the **Student Professional Practice Council (SPPC)** that establishes a *cohort of about 50 diverse multidisciplinary honors students majoring in ME, EE, or CS* engaged in student teams and work groups in co-curricular student-managed personal and professional development activities and events in collaboration with corporate partner employees/alums and recent retirees along with members of local professional chapters of ACM, ASME, and IEEE that complement the academic professional practice projects and programs. The objective of the SPPS program is to further establish THE UNIVERSITY as an exemplar model for enrolling, retaining and graduating computer science and engineering students of the highest potential who are prepared to enter and succeed in the professional workplace.
3. ***K-16+ Diversity/Transfer Scholars Initiative*** – an exemplar model that would *embed the addressing of diversity and inclusion issues at the core of the pilot model* and when it is scaled. A strong diverse student leadership group is essential to collaborate effectively with corporate partners to address various diversity, equity, inclusion, pathway and pipeline

issues. SPPS member student scholar leaders representing national diversity student organizations (NSBE, SHPE, SWE) would establish the **Student Diversity Solutions Council (SDSC)** in conjunction with their respective local professional chapters.

4. **Transfer Scholars Program (TSP)** – Due to community college enrollment characteristics in most communities, it is anticipated that most of the transfer students will be low-income underrepresented minorities and women from three or more partner local community colleges. Highest potential transfer students will be awarded full tuition scholarships and each finalist would have the opportunity to interview for an internship with Strategic Corporate Partners for the summer prior to the academic year as an incoming student.
5. **Strategic Corporate Partnership Initiative (SCPI)** – a world class initiative that engages corporate partner employees/alums and recent retirees with students, faculty and staff in a variety of experiences. The goal is to leverage the curricular Professional Practice Program and co-curricular Student Professional Practice Scholars initiatives to create new higher education/industry partnering standards. This will provide an alternative to traditional university Corporate Partner/Affiliate Programs that tend to treat corporate partners as donors or sponsors of university-developed programs that typically provide various levels of *access* to faculty and students. By engaging corporate investor/partners in creating the sustainable innovations and programs that foster and support student-centered active learning, THE UNIVERSITY would immediately enhance existing corporate relationships and develop new ones. For example, an alumni chapter would be established within each SCP with a designated lead representative for each Council’s Industry Innovation Board

Founding Strategic Corporate Partner Investment and Benefits – The distinguishing element in implementation of the model is a new relationship for partnering between industry and higher education, one in which the companies are viewed not as donors but as investor/partners expecting a strong return on investment while providing new sources of human and financial support for students and student programs. Company employees, especially alums and recent retirees represent critical human and financial resources to complement university faculty/staff who are already working at capacity.

Strategic Corporate Partners would be represented on the Executive Council and the SPPC, SDSC and FPPC Industry Innovation Boards and participate in the on-going development of strategic self-sustaining programs.