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Developing Articulation Agreements with Community Collges for a New Engineering Technology program

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Developing Articulation Agreements with Community Colleges for a New Engineering Technology Program

Abstract

In 2022, we developed a new Bachelor of Science program in Engineering Technology with emphases in manufacturing technology and sustainable energy and transportation by converting an existing industrial technology program. The program was designed in alignment with ABET Engineering Technology Accreditation Commission (ETAC) general criteria and received ABET accreditation in 2024. It is built upon a foundational curriculum that includes differential and integral calculus, calculus-based physics, and chemistry. Lower-division coursework includes Automobile Technology, Machine Shop Technology, Computer-Aided Design, Industrial Safety, and Electronics, with most Engineering Technology courses delivered as integrated lecture-and-laboratory experiences. This approach distinguishes the program from many comparable offerings.

The development of transfer pathways for this new program presented several challenges. Engineering transfer pathways are well-established, but courses would be redundant or misaligned in an Engineering Technology curriculum. In addition, the Engineering Technology and technology-related programs offered by regional community colleges were often non-ABET-accredited and frequently structured around technician-level workforce preparation in a single career field, such as automotive or machining technology. These programs typically emphasize extensive hands-on training with limited mathematical rigor, resulting in significant credit loss for students seeking to transfer into a baccalaureate Engineering Technology program.

Through sustained collaboration with community college partners, including participation in advisory boards, faculty-to-faculty discussions, and iterative curriculum reviews, we developed articulated transfer agreements tailored to the applied and laboratory-intensive nature of the Engineering Technology curriculum. Central to this effort was determining whether students who had completed approximately 60 semester units at a community college could complete the Engineering Technology degree by taking an additional 60 upper-division units. This process led to the creation of transfer pathways that do not require completion of a traditional associate degree when portions of those degrees are misaligned with the Engineering Technology program requirements. This paper describes the development process, the challenges encountered, and the resulting transfer pathway framework, contributing a documented model for Engineering Technology articulation that addresses a recognized gap in the transfer literature.

Literature Review:

There have been many studies on the challenges faced by engineering transfer students. Ogilvie (2014) conducted a comprehensive review of the literature on transfer student pathways to engineering degrees and identified a substantial body of work examining academic preparation, persistence, institutional support structures, and articulation practices. Subsequent research has expanded this body of work by quantitatively examining transfer outcomes and structural barriers within engineering pathways. Studies on credit transfer and credit loss have shown that misalignment between community college coursework and engineering degree requirements can

delay graduation and lead to excess units, reinforcing the importance of clearly articulated pathways (Grote, Ogilvie, & colleagues, 2025). Similarly, systematic reviews of engineering transfer student persistence identify multiple conceptual frameworks and institutional factors influencing student success, further indicating the maturity of the engineering transfer literature (Shealy et al., 2020).

In contrast, transfer pathways specific to Engineering Technology (ET) programs are less extensively documented and are comparatively fragmented across the literature. While engineering transfer research frequently addresses standardized lower-division curricula and common prerequisite structures, ET programs vary widely in curricular emphasis, laboratory intensity, and mathematical preparation. As a result, ET transfer pathways often resist standardization and are less frequently represented in statewide or national transfer frameworks.

Craig, L. (2019) documented Successful Factors for Native and Community College Transfer Students in Engineering Technology at a Four-Year University. Arao, Ayoobi, and Merolla (2024) conducted a review of transfer students' experiences, identity development, and outcomes in Engineering Technology programs and noted that ET transfer students remain underrepresented in the broader transfer literature.

When ET transfer pathways are documented, they are most often presented as institution-specific case studies or 2+2 pathway implementations, often developed to address local workforce needs or serve place-bound students. For example, studies evaluating Engineering Technology Scholars programs or specialized transfer initiatives focus primarily on student outcomes and transition experiences rather than on transferable articulation frameworks applicable across institutions (Arao et al., 2023). While these studies provide valuable insight into Engineering technology student success, they collectively do not establish a standardized, widely adopted model for ET transfer comparable to those in traditional engineering disciplines.

This disparity reflects structural differences between engineering and ET curricula, as well as the historical emphasis in engineering education research. The present study seeks to address this gap by documenting the development of an articulation framework for a Bachelor of Science in Engineering Technology program, contributing a replicable model to the emerging body of ET transfer scholarship.

This gap underscores the need for systematic documentation of replicable ET articulation models.

Background:

In 2022, we developed a new engineering technology program by converting an existing industrial technology program, focusing on manufacturing technology and sustainable energy/transportation. This program was created in alignment with the ABET ETAC general criteria guidelines and received ABET accreditation in 2024. It was built on a foundational framework of differential and integral calculus, general education physics, and chemistry. Our program includes lower-division courses in Automobile Technology, Machine Shop Technology, Computer-Aided Design, Industrial

Safety, and Electronics. The majority of our Engineering Technology lower-division courses were Lecture-plus-Lab combinations, a feature that sets us apart from other programs.

Challenges:

We faced challenges in our new endeavor, as there were well-defined, articulated programs in engineering, and many of those courses would be redundant in our engineering technology program. Also, the Community College Engineering Technology programs we dealt with did not have ABET accreditation. Besides, many Technology programs at community colleges were geared toward training technicians in a single career field, with extensive coursework and limited course transferability, such as programs to become automobile or machining technicians. These programs require minimal mathematical skills, and upon transfer, students will lose many of the credits they earn at their Community Colleges.

Method:

We held many meetings with our local community college partners and their advisory board members to develop transfer agreements for our Engineering Technology program. The Engineering Technology Program Curriculum Structure is shown in Figure 1. While General Education courses had well-established articulation, including Mathematics, Physics, and Chemistry, we had issues aligning the Engineering Technology Lower Division courses with Community College courses. They were ETEC 1100 (Introduction to Engineering Design), ETEC 1000 (Automotive Systems), TECH 1300 (Introduction to Graphics Communications), ETEC 1020 (Industrial Safety), ETEC 1200 (Practical Electronics), ETEC 1600 (Introduction to Metal Working), and ETEC 2070 (Engineering Technology Materials). That said, our Physics and Chemistry requirements are non-calculus-based, with lecture and lab components. This distinction from the engineering requirements has also created some issues with articulation.

When discussed with several community college partners, they emphasized the need for students who complete 60 semester credits to complete their four-year degree by taking an additional 60 units. A major issue transfer students face is taking courses that do not count toward their degree, which can lead them to spend extra years in the program or become frustrated and leave the program altogether. It was emphasized that the need to complete the calculus course (MATH 2110) and the PHYS course at the community college, as those two are prerequisites for junior-level courses that lead to a one-year senior design sequence.

Solution:

One such example transfer path developed is shown in Figure 2 with the East Los Angeles College.

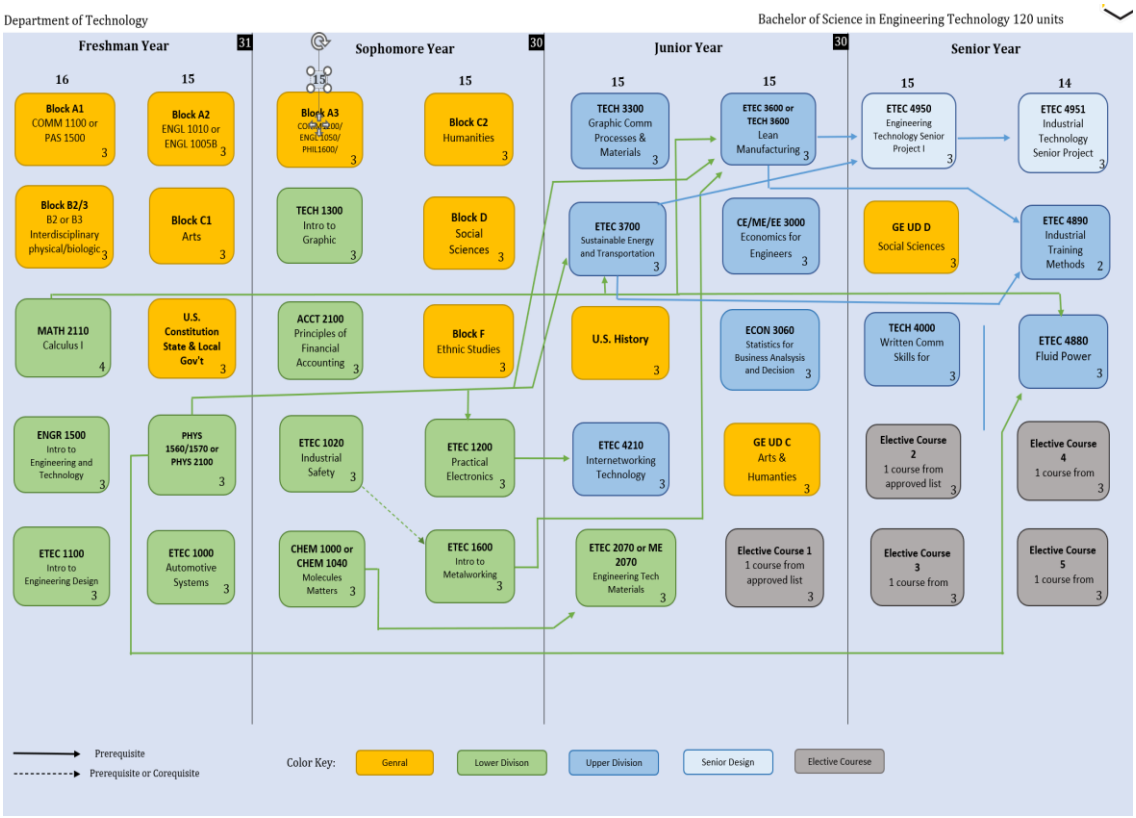

Figure 1: Engineering Technology Curriculum Structure

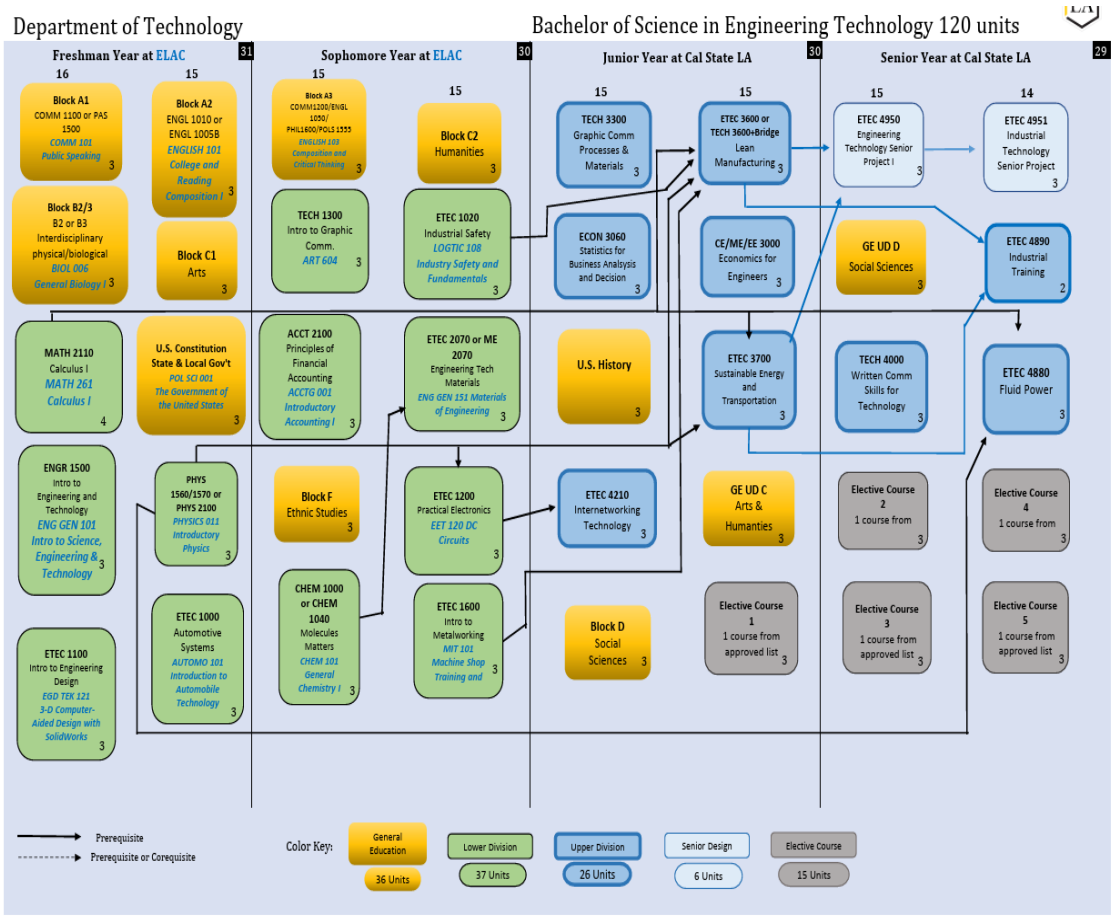

Figure 2: Lower Division Transfer courses from a local Community College (East Los Angeles College)

The transfer agreements developed were formalized by being posted on the assist.org transfer agreement site, as shown in Figure 3. ASSIST (Articulation System Stimulating Interinstitutional Student Transfer) is California's statewide system for publishing faculty-approved articulation agreements between the California Community Colleges and the four-year colleges. This is a publicly accessible record of course equivalencies used for transfer advising and degree planning. Between Fall 2022 and Fall 2025, 41 transfer students enrolled and navigated the degree path.

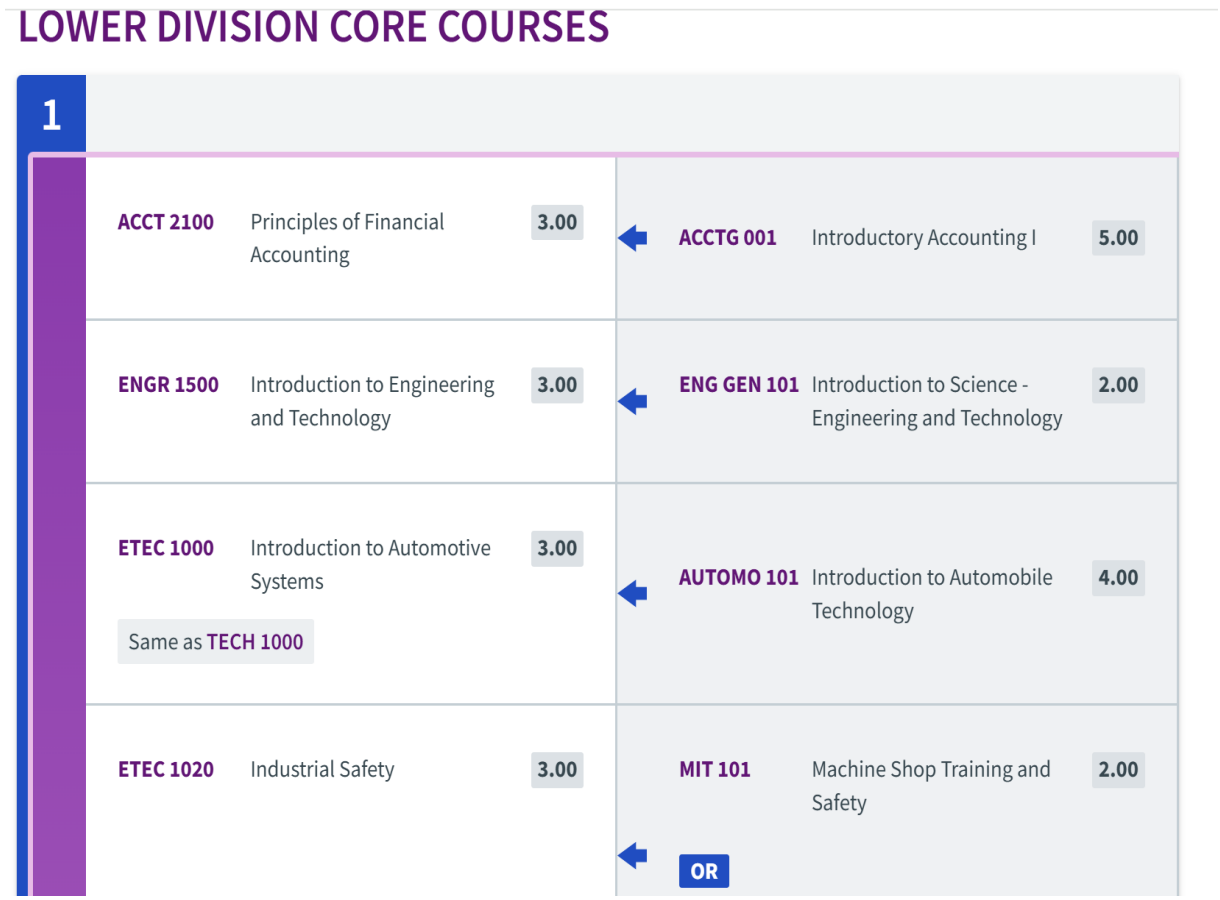

Figure 3: Transfer Agreement of Engineering Program with East Los Angeles College posted on Assist.org

After the Student Transfer Achievement Reform Act (SB 1440) was passed in California in 2010, the state established a system of associate degrees for Transfer that guarantees community college students priority admission to the California State University (CSU) system with junior standing upon meeting specific requirements. SB 1440's transfer degree framework was designed to simplify and streamline the transfer process, but it does not guarantee automatic admission into the University of California (UC) system. In parallel, many campuses use the Transfer Evaluation System (TES), a centralized database of course equivalencies approved by universities to support transfer planning by showing how courses from other institutions may apply toward degree requirements; TES includes equivalencies from in-state, out-of-state, private, and some international institutions, depending on the campus. Unlike the formal statewide articulation system maintained on ASSIST.org for California public institutions, TES is a tool for equivalency management and not a legislative product of SB 1440. For specialized majors such as Engineering Technology, documented transfer equivalencies in TES often focus on general education requirements, and there may be fewer articulated course equivalents for discipline-specific technical

coursework across institutions. As a result, this paper does not address the transfer agreements via TES.

Conclusion:

The articulation agreements developed through this project were formally approved and published on ASSIST, providing a publicly accessible and authoritative record of transfer pathways into the Bachelor of Science in Engineering Technology program at CSU Los Angeles. By documenting these pathways within the state's established articulation infrastructure, this work enhances transparency for students and advisors. It advances the documentation of Engineering Technology transfer pathways, which remain less systematically represented than those for traditional engineering programs.

Key lessons include the importance of early collaboration between faculty and articulation officers, clear documentation of learning outcomes, particularly for laboratory-intensive courses, and alignment of applied technical coursework. Ongoing challenges include curricular variability across ET programs and differences in laboratory resources. For institutions operating in other state systems, the structured documentation, cross-institutional coordination, and public publication of agreements are essential steps toward improving clarity and equity in ET transfer pathways. However, our university's transfer students are mainly from California Community Colleges.

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