

Grant Recipient Report

Steel Curriculum Development Grant

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The proposed curriculum development plan envisions structuring steel curriculum in such a way that it leads to a holistic knowledge creation among students about the field of steel metallurgy. It requires a three-pronged approach — integration of theory, lab (hands-on activities), and simulation as depicted pictorially in Fig. 1.

The steel industry has always played an essential role in the national security and prosperity. The U.S. North American steel industry already manufactures steel with the lowest carbon footprint and a good safety record. Furthermore, in the recent push to decarbonize the iron- and steelmaking processes, steel manufacturing is poised to become even “greener.” However, this view is not shared by a large swath of the general public, which still views steel production as a “dirty job” and full of health and safety issues. This mentality has caused a diminished appetite for jobs in the steel industry among youths. This issue is compounded further due to the disappearing steel-related teaching and research infrastructure from most materials science and engineering departments, especially in the U.S. As a result of dwindling interest in steel and a shortage of skilled workforce for the steel industry, there is a need for investment in steel-related education and research from various stakeholders. Although the solution to this problem is multifaceted, a small step toward skilled workforce development is supporting steel-related curricula at U.S. universities and colleges.

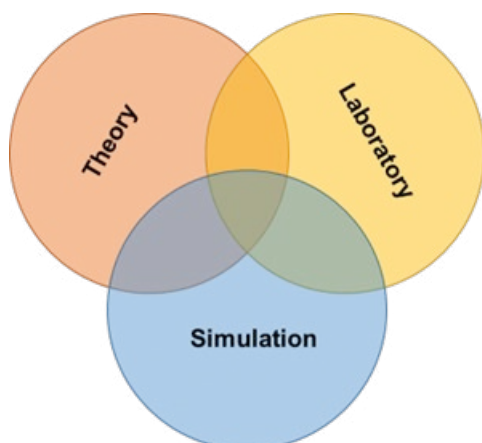
To that end, this proposal envisions developing a steel-related curriculum integrating theory, lab and simulation in the Department of Metallurgical and Materials Engineering at the University of Alabama during the 2024–2027 period. A steel-related course with these three elements is believed to deliver steel education to the students holistically and rekindle enough interest among students for steel to join steel-related industries.

The revised ferrous metallurgy course was offered in the spring 2025 semester. Four undergraduate and two graduate students registered for this course.

On 11 April 2025, a group of seven students were provided with an opportunity to tour CMC Steel Alabama in Birmingham, where they got to experience firsthand steps starting from raw materials charging in the electric arc furnace, billet casting, non-flat products rolling and storage. ♦

Figure 1

An overview of steel curriculum development plan involving theory, lab and simulation.



Undergraduate and graduate students from The University of Alabama toured CMC Steel Alabama for a field trip as part of their ferrous metallurgy course.