2020–2021 GRANT RECIPIENT REPORT

Kinnor Chattopadhyay University of Toronto

STEEL PROFESSOR AND STEEL CURRICULUM DEVELOPMENT GRANT

The **AIST Foundation Steel Professorship** has helped me immensely in carrying forward the activities I had initiated with the Kent D. Peaslee Junior Faculty Award. In the academic year 2020–2021, we have built new relationships with steel companies and have been able to kick off new, exciting projects in iron and steel with specific emphasis on machine learning and digitization. These include a project on basic oxygen furnace (BOF) endpoint control using machine learning, a digital twin development project for continuous casting, an air knife simulator for galvanizing, and finally a curved mold water model for casting. We also attended several steelmaking-related webinars offered by Stahl Institute VDEh, Indian Institute of Metals, and the Iron and Steel Institute of Japan. We have also engaged industrial speakers in our iron and steel courses. We have received approval from the University of Toronto to offer more courses related to iron and steel, including a stand-alone course on ironmaking, a course on modeling of the iron and steel process and industrial problem-solving, and a course related to machine-learning applications in iron and steel.

Currently, I have eight graduate students working on steelmaking and casting projects covering the area of BOF steelmaking, continuous casting, and steel powder production and machine learning. This year, organizing events was a challenge because of the COVID-19 lockdowns, so we decided to participate in different webinars instead. I also gave a couple of lectures on Zoom at two different online seminars.

Through the **AIST Steel Curriculum Development Grant,** I was able to plan and deploy several courses related to iron and steel at the University of Toronto. A graduate course on iron and steel (MSE 1037) and a fourth-year elective course on ferrous metallurgy (MSE 437) are already running every year with excellent guest lecturers from the local steel industry. Additionally, a stand-alone ironmaking graduate course is being developed in collaboration with Shamik Ray from Stelco. I will start a new course called Machine Learning Application in Process Metallurgy (MSE 1063) in July 2022. Additionally, I am planning a course with Joydeep Sengupta of ArcelorMittal Dofasco G.P. called Industrial Processing and Model Applications for Practical Problem-Solving in Steelmaking and Casting (MSE 10XX) in 2022 as well. I am submitting a proposal with fellow University of Toronto professor Yu Zou for a physical metallurgy of steel course

in 2023. The deployment of many of these courses were delayed because of the COVID-19 lockdown.

The Steel Curriculum Development Grant helped me hire teaching assistants, hire photo and video editors, and develop slides, and finally get matching support from the university and industry to develop all these iron and steel–related courses at the University of Toronto. ✦