The Program

The University of Northern Iowa (UNI) metal casting program is focused on training students in the fundamental knowledge of foundry processes and products with a strong developmental integration of managerial, leadership, and communications skills through the manufacturing technology core curriculum and university’s liberal arts program.

The UNI Metal Casting Center is a leader in independent research specializing in metal casting materials, processes and technology that intends to enhance education for future professionals. With revolutionary metal casting, molding, and 3D printing equipment, the MCC is able to utilize its equipment to advance learning and push the boundaries of technology.

Students graduate with a BS in Manufacturing Engineering Technology with a concentration in one or more of the following: Metalcasting, Design, or Advanced Manufacturing.

The Curriculum

UNI’s metal casting program is divided into five areas directly related to the foundry: Transport Phenomena, highlights the basics related to heat transfer and fluid flow with applications in hydraulics, pneumatics and power generation. Emphasis is also placed on simulation concepts in developing a variety of physical models. Applied Metallurgy: expands on basic metallurgy concepts though experimental learning activities and lab techniques. Solidification, thermodynamics of metal and physical metallurgy are integrated to understand the relation between mechanical properties and cast microstructure. Molding Practices: these processes are an integral aspect of foundry operations with their use of process control points and laboratory techniques. Melting Process, emphasis placed on basic melting techniques for ferrous and non-ferrous operations, techniques to optimize melt quality and understand the various techniques as part of total quality management. Tooling Practices: usage of fundamental gating and riser design techniques with solidification modeling. These processes are applied to the casting design process with the addition of incorporating production and operation management principles to develop tooling while achieving the best economical and reliable casting design.

Each course introduces students to in-depth concepts and career opportunities in casting design, patternmaking, casting simulation, metallurgy, melting control, and molding control across the major metal casting industry segments. Additionally, each course has a pedagogy centered on 50% classroom discussion and 50% hands-on training, providing job ready students for the foundry industry.

The Facilities

The University of Northern Iowa has set up a large area for their metalcasting education program. Their fully equipped foundry covers 5500 square feet of space; there are 4000 square feet dedicated to core and mold testing and sand analysis; 1000 square feet houses the mechanical testing and analysis equipment; and the additive manufacturing area covers 15,000 square feet.
The Professor

Scott Giese has been the FEF Key Professor since 2004. He attended Erie Community College and received his B.S., M.S. and Ph.D. from the University of Alabama-Tuscaloosa. Following a metallurgical engineer internship at Hitchcock Industries, Scott served as a graduate Research and teaching assistant at the University of Alabama for five years before accepting a position at the University of Northern Iowa. Professor Giese has headed up 45 funded research projects over the years, as well as having over 30 papers published. He has received multiple awards from AFS and was presented with the FEF/AFS Distinguished Professor Award in 2012.

Scott can be reached at scott.giese@uni.edu. The FEF Key School Contact is Terry McClellan who can be reached at mcclellanterrence@johndeere.com.

The Students

Faculty, staff, and students actively participate with professional societies and industry leaders to promote technology transfer while fostering leadership skills for students in the AFS Student Chapter. Through this unique pedagogy and strong interaction with professional organizations and industry, students graduating from the metal casting program possess the necessary technical/engineering knowledge, comprehensive managerial abilities, and broad communication skills to become leaders in the foundry industry.

Processes and experiences that are available to the students are:

- **Molding:** Green Sand, Permanent Molds, 3D Sand Printing, Die Casting, Investment Casting, Lost Foam, and Chemically Bonded
- **Metals:** Aluminum, Copper Base, Iron, and Steel
- **Core Making, Pattern Making, 3D Printed Patterns, and Casting Simulation**
- **Processes:** Heat Treating, Machining, Mechanical Testing, Metallography, and Metrology

UNI students also have many opportunities for service and off-campus learning experiences. Each year they open up their foundry for local Boy Scouts to come and earn their Metal Badge; the students also participate in Manufacturing Day events and the SWE Expanding Your Horizons event. During the school year, several foundry tours are scheduled, as well as participating in the annual AFS Wisconsin Casting Competition.

Over the past four years, 20 FEF registered students have taken a job in metalcasting or related industry, and 17 students have participated in internships and/or co-ops in metalcasting or related industry in the past two years.