

Metallurgical Engineering



Career Profile

Metallurgical Engineering is the branch of engineering that develops and supplies the materials for virtually every other engineering field. Three-fourths of all chemical elements are metals, so metals play a vital role in nearly every aspect of modern life. Metallurgical engineers transform the Earth's mineral resources into finished products by extracting metals from ores, producing ceramics from metal compounds, and fabricating high-performance composite structures.

Materials and metallurgical engineers are employed throughout the nation and the world.

Accreditation

The South Dakota School of Mines and Technology is accredited by the Higher Learning Commission of the North Central Association of Colleges and Secondary Schools, the recognized accrediting agency for the north central states. In 2006, the HLC voted to continue accreditation of the School of Mines. The School of Mines has been accredited since 1925.

The metallurgical engineering curriculum is also accredited by the Engineering Accreditation Commission of ABET, Inc.

Labs and Facilities

Laboratory facilities in metallurgical engineering are equipped with state-of-the-art instrumentation for instruction in mineral and materials processing, chemical metallurgy, physical metallurgy, and mechanical metallurgy. Sample preparation facilities, gravitational and magnetic separators, froth flotation equipment, and others are available for mineral and materials processing. Induction melting and vacuum furnaces, corrosion

potentiostat, are available for chemical metallurgy. X-ray diffraction units, Fourier transform infrared spectrometer, Raman Spectrometer, Langmuir-Blodgett trough, metallographs, atomic force microscope, and equipment for measuring the physical and mechanical properties of materials also are available.

Faculty

Chair: Douglas W. Fuerstenau Professor Dr. Jon Kellar
Professor: Dr. Stan Howard and Dr. William Cross
Associate Professor: Dr. Dana Medlin
Assistant Professor: Dr. Michael West
Instructor: Mr. Bill Arbegast

Features and Strengths

The School of Mines has a long tradition and heritage in metallurgical engineering. The metallurgical engineering program provides the student with a high quality education and an excellent atmosphere in which to learn. The small student-to-faculty ratio reinforces the learning environment between the student and professor.

Program Overview

Today's materials are exotic and so are the methods of producing them. Metallurgy is based upon the principles of chemistry, physics, and mathematics. These sciences provide an understanding of the methods of metal production processes and the behavior of materials. Students learn the science and technology involved in metal production processes and the properties of these and other materials.

In courses such as mineral processing, metallurgical thermodynamics, kinetics, and metallurgical design, students learn how materials are produced. Laboratory exercises range from concentrating and refining materials to analyzing the microstructure of materials. Environmental concerns including resource conservation, recycling, and pollution control are major elements of the course of study. Students are often part of design teams that include students from other departments. These teams build human-powered vehicles, Mini Indy race cars, unmanned aerial vehicles, and compete against teams from other universities.

Outcomes

- School of Mines metallurgical engineering graduates received salary offers that average more than \$56,000.
- 100 percent of 2005-06 School of Mines metallurgical engineering graduates were placed in their field or entered a graduate program within a year of graduation.
- 80 percent of graduates gain real-life experience through internships and co-ops.
- Companies hiring metallurgical engineering graduates include Micron Technology, Harley-Davidson, and John Deere.

Student Organizations

Students at the School of Mines also have a variety of opportunities for extra-curricular activities that range from music, intramurals, and drama to ski and snowboarding clubs, and more than 75 other clubs and professional student organizations. These are important activities for our students and we encourage them to take full advantage of out-of-classroom events.

The Center for Advanced Manufacturing and Production (CAMP) is designed to teach students engineering, science and design skills, as well as the ability to work in teams. Team members design, build, market and raise the money for their projects. All students are welcome to work on CAMP projects.

Research

Students have the opportunity to be involved in research with professors conducting work on projects such as friction stir processing, funded by the National Science Foundation; automotive composites, funded by the Automotive Composites Consortium; lightweight space structures, funded by the United States Department of Defense; and more.

For More Information contact:
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MET 351	Engineering Design I	2
Set A or C		7
TOTAL		16

Second Semester

MET 352	Engineering Design II	1
MATH 373	Intro to Numerical Analysis	3
Free Elective		2
Set B or D		11
TOTAL		17

SENIOR YEAR

First Semester

MET 464	Engineering Design III	2
IENG 301	Basic Engineering Economics	2
Science Elective		3
Humanities or Social Sciences Elective(s)		3
Set A or C		7
TOTAL		17

Second Semester

MET 433	Process Control	3
MET 465	Engineering Design IV	1
Science Elective		3
Set B or D		11
TOTAL		18

136 credits required for graduation

Curriculum Notes

- ¹ Satisfies General Education Goal #1
- ² Satisfies General Education Goal #2
- ³ Satisfies General Education Goal #3
- ⁴ Satisfies General Education Goal #4
- ⁵ Satisfies General Education Goal #5
- ⁶ Satisfies General Education Goal #6

Set A-Fall Even Years

MET 422	Transport Phenomena	4
Free Elective		3

Set B-Spring Odd Years

MET 321	High Temp Extract/Conc/Rec	4
Directed Met Elective		3
EE 301	Intro Circuits, Machines, Syst	4

Set C-Fall Odd Years

MET 330	Physics of Metals	3
MET 330L	Physics of Metals Lab	1
MET 332	Thermomechanical Treatment 3	

Set D-Spring Even Years

MET 440	Mechanical Metallurgy	3
MET 440L	Mechanical Metallurgy Lab	1
Directed Met Elective		3
MET 310	Aqueous Extract/Conc/Rec	3
MET 310L	Aq Extract/Conc/Rec Lab	1

Curriculum Listing

<http://catalog.sdsmt.edu>

METALLURGICAL ENGINEERING CURRICULUM/CHECKLIST

FRESHMAN YEAR

First Semester

MATH 123	Calculus I ⁵	4
CHEM 112	General Chemistry I ⁶	3
ENGL 101	Composition I ¹	3
Free Elective		2
PE	Physical Education	1
Humanities or Social Sciences Elective(s) ^{3,4}		3
TOTAL		16

Second Semester

MATH 125	Calculus II	4
BIOL 153	General Biology II ⁶ <u>OR</u>	3
BIOL 151	General Biology I ⁶ <u>OR</u>	3
CHEM 114	General Chemistry II ⁶	3
PHYS 211	University Physics I	3
CHEM 112L	General Chem Lab <u>OR</u>	1
PE	Physical Education	1
Humanities or Social Sciences Elective(s) ^{3,4}		3
TOTAL		18

SOPHOMORE YEAR

First Semester

MET 232	Properties of Materials	3
MET 231	Structures and Properties of Materials Lab	1
MATH 321	Differential Equations	4
PHYS 213	University Physics II	3
CHEM 114L	General Chem II Lab <u>OR</u>	1
BIOL 151L	General Biology I Lab <u>OR</u>	1
BIOL 153L	General Biology II Lab	1
ENGL 279	Technical Communications I ¹	3
EM 214	Statics	3
TOTAL		18

Second Semester

MATH 225	Calculus III	4
EM 321	Mechanics of Materials	3
PHYS 213L	University Physics II Lab	1
MET 220	Min Proc and Resource Recov ⁴	
Humanities or Social Sciences Elective(s) ^{3,4}		4
TOTAL		16

JUNIOR YEAR

First Semester

ENGL 289	Technical Communications II ³	
MET 320	Metallurg Thermodynamics	4