

Catalog Home

Welcome to the 2018-2019 Online Undergraduate/Graduate Catalog of the South Dakota School of Mines and Technology (SDSM&T)

The academic catalog is the official source of information for the university's undergraduate and graduate academic programs, courses, policies, degree requirements, and procedures

Should you have questions or concerns about this catalog, please contact the Registrar and Academic Services (RAS) office at 605-394-2400.

Reservation of Rights

The information contained in this catalog is the most accurate available at the time of publication, but changes may become effective before the next catalog is published. It is ultimately the student's responsibility to stay abreast of current regulations, curricula, and the status of specific programs being offered. Further, the university reserves the right, as approved by the Board of Regents, to modify requirements, curricula offerings, and charges, and to add, alter, or delete courses and programs through appropriate procedures. While reasonable efforts will be made to publicize such changes, a student is encouraged to seek current information from appropriate offices. BOR Policy 2:20

University Information

Vision, Mission, Strategic Priorities, and Inclusion Statement

Our **vision** is for the South Dakota School of Mines & Technology to be recognized as an exceptional engineering and science university.

Our **mission** is to prepare leaders in engineering and science; to advance knowledge and its application, and to serve the state of South Dakota, our region, and the nation.

For the latest updates on Mines' Strategic Priorities, please see: www.sdsmt.edu/PursuitOfExcellence/

INCLUSION & DIVERSITY

South Dakota School of Mines & Technology is committed to cultivating an inclusive learning environment where faculty, staff, and students can grow and succeed. We value the diversity of unique backgrounds, experiences, perspectives, and talents within our community. It is our goal to promote a culture of respect, honor, understanding, integrity, and collaboration. It is through this diversity and inclusion that we find our strength.

2018-2019 Academic Year

The South Dakota School of Mines & Technology is one of six universities operating under the authority assigned by the Constitution of the State of South Dakota to the nine-member Board of Regents. The mission of the university is established by the Legislature of the State of South Dakota with programs and organization approved by the Board of Regents. The president is delegated to administer the operation of the university. The traditional collegial process of shared governance for the formation of policies and oversight includes representative organizations to provide recommendations to the president for implementation as appropriate.

South Dakota Board of Regents

Mr. Kevin Schieffer, President
Mr. John Bastian, Vice President
Mr. Jim Morgan, Secretary
Mr. Jim Thares
Mr. Randy Schaefer
Ms. Pam Roberts
Ms. Joan Wink
Mr. David Mickelson

Executive Director

A search is currently underway for the Board of Regents' Executive Director.

South Dakota Public Higher Education Institutions

Black Hills State University, Spearfish
Capital University Center, Pierre
Dakota State University, Madison
Northern State University, Aberdeen
South Dakota School of Mines & Technology, Rapid City
South Dakota State University, Brookings
Black Hills State University-Rapid City, Rapid City
University Center, Sioux Falls
University of South Dakota, Vermillion

SD Mines Councils

Executive Council

The Executive Council is the principal administrative unit at the university. The council members are the President, Provost and Vice President for Academic Affairs, Vice President for Finance and Administration, Director of Marketing and Communications, Vice President for Student Development and Dean of Students, Vice President for Research, Director of Athletics, Director of Human Resources, Director of Facilities and Risk Management, Dean of Graduate Education, Faculty Senate Chair, and SDSM&T Foundation President. The Special Projects Coordinator for the President will serve as the secretary to the Executive Council.

Current members of Executive Council are as follows:

RANKIN, JAMES (2018) President. B.S., South Dakota School of Mines & Technology; M.S., Ph.D., Iowa State University.

BRENTLINGER, ANN (2015) Director, Marketing and Communications. B.A., University of South Dakota; M.A., National American University.

HERMAN, JADE (2011) Special Projects Coordinator, Office of the President. B.S., South Dakota School of Mines & Technology; M.S., University of South Dakota.

KINCART, JOEL (2015) President, South Dakota School of Mines & Technology Foundation.

KOURIS, DEMITRIS (2015) Provost/Vice President, Academic Affairs. Diploma, National Technical University of Athens; M.S., Illinois Institute of Technology, Ph.D., Northwestern University.

LUEKEN, JOEL (2014) Director, Athletics. A.A., Ellsworth Community College; B.A., Ottawa University; M.S., Northwest Missouri State University.

MAHON, PATRICIA G. (2000) Vice President, Student Development and Dean of Students. B.S., M.S., Montana State University-Billings; Ph.D., Kansas State University.

MALOTT, STEPHEN (2014) Vice President, Finance and Administration. B.S., B.A., Georgetown University; M.P.A., University of Southern California.

MONTOYA, THOMAS (2001) Chair, Faculty Senate. B.S., South Dakota School of Mines & Technology; M.S., University of Colorado at Colorado Springs; Ph.D., Georgia Institute of Technology.

PRICE, MARIBETH (1995) Dean, Graduate Education. B.A., Dartmouth College; M.A., Ph.D., Princeton University.

PUSZYNSKI, JAN A. (1991) Vice President, Research. M.S., Technical University, Wroclaw, Poland; Ph.D., Institute of Chemical Technology, Prague, Czechoslovakia.

ROBERTS, JERILYN (2006) Director, Facilities and Risk Management. B.S., M.S., South Dakota School of Mines & Technology.

SHUMAN, KELLI (2005) Vice President, Human Resources. B.S., Black Hills State University; M.S., University of South Dakota.

University Cabinet

The University Cabinet advises the President concerning the development of policy, the governance of the university, strategic planning, and the fiscal operation of the university. The University Cabinet consists of the President, Secretary to the President, Provost and Vice President for Academic Affairs, Vice President for Finance and Administration, Director of Marketing and Communications, Vice President for Student Development and Dean of Students, Vice President for Research, Director of Athletics, SDSM&T Foundation President, Chair of the Faculty Senate, Director of the Alumni Association, Dean of Graduate Education, Chair of the Non-Faculty Exempt Employees Council, Chair of the Civil Service Advisory Council, President of the Student Association, Director of Information Technology Services, and the Director of Facilities and Risk Management.

Current member of University Cabinet are as follows:

RANKIN, JAMES (2018) President. B.S., South Dakota School of Mines & Technology; M.S., Ph.D., Iowa State University.

BRENTLINGER, ANN (2015) Director of Marketing and Communications. B.A., University of South Dakota; M.A., National American University.

DAVIS, ANGELA M. (2018) Secretary, Offices of the President and Provost. B.A., South Dakota State University.

DAVIS, TAYLOR (2015) Chair, Non-Faculty Exempt Council. B.S. Winthrop University.

KINCART, JOEL (2015) President, South Dakota School of Mines & Technology Foundation.

KOLVE, MELISSA (2015) Chair, Civil Service Advisory Council.

KOURIS, DEMITRIS (2015) Provost/Vice President, Academic Affairs. Diploma, National Technical University of Athens; M.S., Illinois Institute of Technology, Ph.D., Northwestern University.

LUEKEN, JOEL (2014) Director of Athletics. A.A., Ellsworth Community College; B.A., Ottawa University; M.S., Northwest Missouri State University.

MAHON, PATRICIA G. (2000) Vice President, Student Development and Dean of Students. B.S., M.S., Montana State University-Billings; Ph.D., Kansas State University.

MALOTT, STEPHEN (2014) Vice President for Finance and Administration. B.S., B.A., Georgetown University; M.P.A., University of Southern California.

MONTOYA, THOMAS (2001) Chair, Faculty Senate. B.S., South Dakota School of Mines & Technology; M.S., University of Colorado at Colorado Springs; Ph.D., Georgia Institute of Technology.

MOORE, MOLLY (2010) Associate Provost for Academic Administration. B.S., South Dakota State University; M.S. University of South Dakota.

OBERPRILLAR, JACOB President, Student Association.

PRICE, MARIBETH (1995) Dean, Graduate Education. B.A., Dartmouth College; M.A., Ph.D., Princeton University.

PUSZYNSKI, JAN A. (1991) Vice President, Research. M.S., Technical University, Wroclaw, Poland; Ph.D., Institute of Chemical Technology, Prague, Czechoslovakia.

ROBERTS, JERILYN (2006) Director, Facilities and Risk Management. B.S., M.S., South Dakota School of Mines & Technology.

SCHUMACHER, BRYAN (1991) Director, Information Technology Services. B.S., South Dakota School of Mines & Technology.

SHUMAN, KELLI (2005) Vice President, Human Resources. B.S., Black Hills State University; M.S., University of South Dakota.

SIMONSON, LARRY (2016) Director, Alumni Association. B.S., M.S., Ph.D., South Dakota School of Mines & Technology.

Civil Service Advisory Council

The civil service employees elect the Civil Service Advisory Council members. This council shall consist of five members, with the offices of chair, vice chair, secretary, and two general board members. The current chair is Melissa Kolve.

Non-Faculty Exempt Employees Council

The Non-Faculty Exempt Employees Advisory Council is elected by the administrative employees who are exempt from the Civil Service Act of the state of South Dakota. The current chair is Taylor Davis.

Faculty Senate

The Faculty Senate consists of nine voting members, two non-voting (ex-officio) members and is chaired by the chair of the Faculty Senate. The ex-officio members are the Vice President for Research and the Provost and Vice President for Academic Affairs. All faculty members may vote in the election of representatives from their discipline and each is eligible for election as a discipline representative. The current chair is Tom Montoya.

Student Association

The Senate of the Student Association is the elected representative council for the formation of recommendations on behalf of enrolled students, including the fees charged to students and the operation of student activities funded through student fees. The current president is Jake Oberprillar.

Academic Organization

Academic departments at South Dakota School of Mines & Technology are organized as follows:

- Chemical and Biological Engineering
- Chemistry and Applied Biological Sciences
- Civil and Environmental Engineering
- Electrical and Computer Engineering
- Geology and Geological Engineering
- Humanities
- Industrial Engineering and Engineering Management
- Math and Computer Science
- Mechanical Engineering
- Materials and Metallurgical Engineering
- Military Science
- Mining Engineering and Management
- Physical Education
- Physics
- Social Sciences

Accreditation

The South Dakota School of Mines & 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, through the Academic Quality Improvement Program (AQIP) process. For more information call (800) 621-7440 or visit: www.ncahigherlearningcommission.org.

In addition, the curriculum in chemistry is approved by the American Chemical Society.

The following bachelors of engineering programs are accredited by the Engineering Accreditation Commission (EAC) of ABET, <http://www.abet.org>: chemical engineering, civil engineering, computer engineering, electrical engineering, geological engineering, industrial engineering and engineering management, mechanical engineering, metallurgical engineering, and mining engineering.

The bachelors of science program in computer science is accredited by the Computing Accreditation Commission (EAC) of ABET, <http://www.abet.org>.

Equal Opportunity Policy

South Dakota School of Mines & Technology does not discriminate on the basis of race, color, national origin, military status, gender, religion, age, sexual orientation, political preference, or disability in employment or the provision of service.

South Dakota School of Mines & Technology is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, national origin, ancestry, religion, gender, age, sexual orientation, marital status, pregnancy, military/Veteran's status, or disability. In adhering to this policy, South Dakota School of Mines & Technology abides by all federal and state statutes and regulations for the protection of employees against discrimination. Inquiries regarding compliance may be directed to the Vice President of Human Resources, South Dakota School of Mines & Technology, 501 East Saint Joseph St., Rapid City, SD 57701, (605) 394-1203.

Academic Calendar

Institutions of higher education, under control of the South Dakota Board of Regents, shall operate on a common academic calendar with common periods during the summer term and the fall and spring semesters at each institution when classes are not in session. Academic calendars shall be designed a minimum of two years in advance with annual extensions recommended to the Executive Director by the Council of Presidents and Superintendents no later than the May meeting.

Fall Semester 2018

Classes begin	August 20
Last day to add or drop a course and adjust fees	August 30
Last day for pass/fail and audit options	August 30
Labor Day Holiday	September 3
Native Americans' Day Holiday	October 8
Midterm (First half of semester ends)	October 12
Graduation application due for undergraduate students (planning to graduate in May or August)	October 15
Midterm deficiencies grades due by midnight	October 17
Early Registration Weeks (Tentative)	October 22-November 9
Last day to drop classes	November 2
Veterans Day Holiday	November 12
Thanksgiving Holiday begins at end of class day	November 20
Classes resume	November 26
Last day of classes	December 4
No class day	December 5
Final examinations	December 6-12
Semester ends	December 12
Fall Graduation	December 15
Final grades are due by midnight	December 19

Spring Semester 2019

Classes begin	January 7
Martin Luther King Jr. Day Holiday	January 21
Last day to add or drop a course and adjust fees	January 16
Last day for pass/fail and audit options	January 16
Presidents' Day Holiday	February 18
Spring vacation begins at end of class day	March 1
Midterm (First half of semester ends)	March 11
Classes resume	March 11
Midterm deficiencies grades due by midnight	March 14
Graduation application due for undergraduate students (planning to graduate in December)	March 18
Early Registration Weeks (Tentative)	March 18-April 12
Last day to drop classes	April 1
Easter Break begins at end of class day	April 18
Classes resume	April 22
Last day of classes	April 26
Final examinations	April 29-May 3
Semester ends	May 3
Spring Graduation	May 4
Final grades are due by midnight	May 8

This calendar conforms to guidelines established by the Board of Regents, but is subject to change at its discretion.

Holidays

The schedule of holidays for the institutions of higher education is listed below. Classes shall not be scheduled to meet on holidays.

New Years Day

January 1*.

Martin Luther King Jr. Day

Third Monday in January.

Presidents Day

Third Monday in February.

Memorial Day

Last Monday in May.

Independence Day

July 4*.

Labor Day

First Monday in September

Native American Day

Second Monday in October.

Veterans Day

November 11*.

Thanksgiving Day

Fourth Thursday in November.

Christmas Day

December 25*

* If January 1, July 4, November 11, or December 25 fall on a Sunday, the Monday following shall be observed as the holiday; if they fall on a Saturday, the previous Friday shall be observed as the holiday.

Drop and Add Period

The drop/add period is the time period during which students may adjust their academic schedule for the term without financial or academic consequences. The last day of the drop/add period for a course is designated as the census date for that course and is the official date for enrollment reporting. The end of the drop and add period for standard and non-standard courses offered in a semester shall be the date the first 10 percent of the term ends or the day following the first class meeting, whichever is later. When calculating 10 percent of the term, breaks of five or more days are not included when counting the total number of days but Saturdays, Sundays, and holidays are. Student registrations can only be added to courses after the end of the drop and add period by approval of the chief academic officer of the university.

Course Abbreviations

Abbreviation	Definition
AES	Atmospheric and Environmental Sciences
ANTH	Anthropology
ART	Art
ARTH	Art History
BIOL	Biology
BME	Biomedical Engineering
CBE	Chemical and Biological Engineering
CEE	Civil and Environmental Engineering
CENG	Computer Engineering
CHEM	Chemistry
CHIN	Chinese
CEM	Construction Management
CP	Career Planning
CSC	Computer Science
EE	Electrical Engineering
EM	Engineering Management
ENGL	English
ENGM	Engineering Management
EXCH	Student Exchange - International
EXPL	Study Abroad
GE	General Engineering
GEOE	Geological Engineering
GEOG	Geography
GEOL	Geology

GER	German
GES	General Engineering and Science
GS	General Studies
HIST	History
HUM	Humanities
IENG	Industrial Engineering
IS	Interdisciplinary Sciences
MATH	Mathematics
ME	Mechanical Engineering
MEM	Mining Engineering and Management
MES	Materials Engineering and Science
MET	Metallurgical Engineering
MSL	Military Science
MUAP	Applied Music
MUEN	Music Ensemble
MUS	Music
NANO	Nanoscience and Nanoengineering
PALE	Paleontology
PE	Physical Education
PHIL	Philosophy
PHYS	Physics
POLS	Political Science
PSYC	Psychology
SOC	Sociology
SPAN	Spanish
SPCM	Speech

Admission - Undergraduate

Authorization for Individual Institutional Policies

Each university may adopt specific admission regulations, consistent with law and the requirements set by the Board of Regents, as may be required for each school or program to assure acceptable student preparation and enrollment levels. A copy of such regulations and any subsequent amendments shall be filed with the Executive Director and shall be subject to review by the Board of Regents.

Admissions Requirements

The Board of Regents (BOR) requires that all students meet the minimum course requirements for admission to the South Dakota School of Mines and Technology. These are described below under South Dakota Board of Regents Minimum Undergraduate Admissions Requirements.

In addition, The Board of Regents approved the following requirements for admission to the School of Mines:

School of Mines will **automatically accept** for admission students who:

- obtain an ACT composite score of at least 25
AND obtain an ACT math subscore of at least 25
(or SAT-I composite score of 1200 and SAT-I
Math subscore of 590)

AND

- achieve a high school GPA of at least 2.75 on a
4.0 scale

OR

- South Dakota Regents' Scholar

School of Mines will **review and consider for acceptance** students who meet the following requirements:

- obtain an ACT composite score of at least 20 (or
SAT-I equivalent composite score of 1030)

AND

- obtain an ACT math subscore of at least 20 or
(SAT-I math subscore of at least 520)

AND

- achieve a high school cumulative GPA of at least
2.75 on a 4.0 scale.

All applicants not meeting the admission requirements listed above will be reviewed by the Admissions Committee. The committee considers high school curriculum (special consideration is given to math and science coursework), grades, and test scores.

School of Mines ACT CODE - 3922

School of Mines SAT CODE - 6652

South Dakota Board of Regents Minimum Undergraduate Course Requirements

1. Minimum Course Requirements

All baccalaureate or general studies students under twenty four (24) years of age, including students transferring with fewer than twenty-four (24) credit hours, must meet the following minimum high school course requirements:

- a. Four years of English - Courses with major emphasis upon grammar, composition, or literary analysis. One year of debate instruction may be included to meet this requirement.
- b. Three years of advanced mathematics - algebra, geometry, trigonometry or other advanced mathematics including accelerated or honors mathematics (algebra) provided at the 8th grade level; not included are arithmetic, business, consumer, or general mathematics or other similar courses.
- c. Three years of laboratory science - Courses in biology, chemistry, or physics in which at least one (1) regular laboratory period is scheduled each week. Accelerated or honors science (biology, physics, or chemistry) provided in the 8th grade shall be accepted. Qualifying physical science or earth science courses (with lab) shall be decided on a case-by-case basis.
- d. Three years of social studies - History, economics, sociology, geography, government - including U.S. and South Dakota, American Problems, etc.
- e. One year of fine arts for students graduating from South Dakota high schools - Art, theatre, or music (appreciation, analysis, or performance). Documented evidence of high school level noncredit fine arts activity will be accepted for students graduating from high schools in states that do not require completion of courses in fine arts for graduation.

2. Alternate Criteria for Minimum Course Requirements

- a. Students who do not successfully complete four years of English may meet minimum course requirements through one of the following:
 - i. An ACT subtest score of 18 or above;
 - ii. An Advanced Placement Language and Composition or Literature and Composition score of 3 or above.
- b. Students who do not successfully complete three years of advanced mathematics may meet minimum course requirements through one of the following:
 - i. An ACT mathematics subtest score of 20 or above;
 - ii. An Advanced Placement Calculus AB or Calculus BC score of 3 or above.
- c. Students who do not successfully complete three years of laboratory science may meet minimum course requirements through one of the following:
 - i. An ACT science reasoning subtest score of seventeen (17) or above;
 - ii. An Advanced Placement Biology, Chemistry, or Physics B score of 3 or above.
- d. Students who do not successfully complete three years of social studies may meet minimum course requirements through one of the following:
 - i. An ACT Social Studies/Reading subtest score of seventeen (17) or above;
 - ii. An Advanced Placement Microeconomics, Macroeconomics, Comparative or United States Government and Policies, European or United States History, or Psychology score of 3 or above.
- e. Students graduating from South Dakota high schools that do not successfully complete one year of fine arts may demonstrate fine arts knowledge or competency through the following:
 - i. An Advanced Placement History of Art, Studio Art drawing, or general portfolio or Music Theory score of 3 or above.

Non-Traditional Students

For purposes of admission, a degree seeking student who has attained the age of 24 and has not previously attended any post-secondary institution is classified as a non-traditional student. Non-traditional students who are high school graduates or have completed the general equivalency diploma (GED) and can demonstrate college algebra readiness will be considered for admission.

It is the policy of the South Dakota School of Mines and Technology to recognize that there is a great diversity in the background and goals of non-traditional students seeking college admissions. Each individual is evaluated for admission to the School of Mines based on the minimum admission requirements as prescribed by the Board of Regents **and who demonstrate college algebra readiness**. Additional consideration will be given to non-traditional students who do not meet the BOR undergraduate admission requirements.

Non-traditional students who are high school graduates and meet the university minimum requirements **and demonstrate college algebra readiness** will be admitted.

Non-High School Graduates

An applicant for baccalaureate or associates admissions who is not a high school graduate must: Be 18 years or older to meet the compulsory school attendance requirement in South Dakota; and completed the general equivalency diploma (GED) with the following minimum test scores: The total cumulative standard test scores for all five tests items must total 2250 with no standard test score below 410 or complete the High School Equivalency test (HiSET) and obtain a minimum score on each of the five subsections; OR complete the Test Assessing Secondary Completion (TASC) and obtain a minimum score of 500 on each of the five subtest categories.

Regents Scholars

South Dakota high school graduates completing the following high school courses with no final grade below a "C" (2.0 on a 4.0 scale) and an average grade of "B" (3.0 on a 4.0 scale) shall be designated as Regents Scholars and shall be eligible to receive a Regents Scholar Diploma upon request by a high school administrator to the Department of Education and Cultural Affairs. High school graduates designated as Regents Scholars automatically are admitted to all six public universities. (Regent Scholars still need to submit the admission application.)

- **4 units of English:** Courses with major emphasis upon grammar, composition, or literary analysis; one year of debate instruction may be included to meet this requirement.
- **4 units of algebra** or higher mathematics: algebra, geometry, trigonometry, or other advanced mathematics including accelerated or honors mathematics (algebra) provided at the eighth grade level; not included are arithmetic, business, consumer or general mathematics, or other similar courses.
- **4 units of science including 3 units of approved laboratory science:** Courses in biology, chemistry, or physics in which at least one (1) regular laboratory period is scheduled each week. Accelerated or honors science (biology, physics, or chemistry) provided in the eighth grade shall be accepted. Qualifying physical science or earth science courses (with lab) shall be decided on a case-by-case basis.
- **3 units of social studies:** History, economics, sociology, geography, government-including U.S. and South Dakota, American Problems, and so on.
- **2 units of a modern (including American Sign Language) or classical language**
- **1 unit of fine arts:** Effective fall 2002 for students graduating from South Dakota high schools in: Art, theatre, or music appreciation, analysis, or performance.
- **1/2 unit of computer science:** Students will have basic keyboarding skills and have had experience in using computer word processing, database and spreadsheet packages, and in using the Internet or other wide-area networks.

Readmission Procedures

A student who has interrupted attendance by a semester or more must submit an application for readmission and if attendance has been interrupted by three or more semesters, a student is also required to pay the application fee. Any student not under academic or disciplinary suspension will be automatically readmitted.

Undergraduate Transfer Admission

A. Transfers to Baccalaureate Programs

Students under twenty-four (24) years of age transferring into baccalaureate degree programs with fewer than twenty-four (24) transfer credit hours must meet the freshman baccalaureate degree admission requirements. Students with twenty-four (24) or more transfer credit hours with a GPA of at least 2.75 and proof of college algebra readiness are automatically accepted into baccalaureate degree programs. Transfer students with GPAs less than 2.75 will be considered on a case-by-case basis by the SDSM&T Admissions Committee. Transfer applicants with a cumulative college GPA below 2.0 will not be admitted degree-seeking. If students are applying for federal financial aid, they must meet federal guidelines for transfer students.

B. Students who Transfer to Associate Programs

Students who are under the age of twenty four (24) at the start of the term and who are transferring into associate degree programs with fewer than 12 transfer credits hours must meet the associate degree admissions requirements. Students with 12 or more transfer credit hours with a cumulative GPA of at least 2.75 may transfer into associate's degree programs. Specific degree programs may include additional admissions requirements.

C. Students from Accredited Colleges or Universities

Students may be accepted by transfer from other non Regental universities outside of the SD system: preferential consideration shall be given to applicants from institution which are accredited by their respective regional accrediting association. Advanced standing shall be allowed within the framework of existing rules in each college. (Refer to BOR policy 2:5, Transfer of Credit)

D. Students from Non-Accredited Colleges

A university is not required to accept credits from a non-accredited college or university. The university may admit the applicant on a provisional basis and provide a means for the evaluation of some or all of the credits. Credits from colleges or universities which are not accredited by a regional accrediting association may be considered for transfer subject to all other provisions in BOR Policy 2:5 and any conditions for validation which may be prescribed by the accepting institution.

E. Former Students

A student returning to the institution or a student who has attended another higher education institution in the Board of Regents system is required to pay the application fee and, he or she must also submit an application for readmission and other required documents if he or she has interrupted attendance by two (2) or more semesters. A former student shall be considered as a transfer student if he or she has attended another institution during the period of interruption of attendance.

F. Suspended Students

A transfer applicant under academic suspension from the last college attended shall not be considered for admission during the period of suspension or, if suspended for an indefinite period, until one (1) semester has passed since the last date of attendance at the previous school. A system transfer student must first be reinstated to their previous institution prior to seeking admission to the School of Mines.

G. Disciplined Students

A transfer applicant under disciplinary suspension shall not be considered for admission until a clearance and a statement of the reason for suspension is filed from the previous institution. The university shall take into account the fact of the previous suspension in considering the application.

Special (Non-degree Seeking) Students

A prospective student at South Dakota School of Mines and Technology who wishes to be classified as a special student must complete the Application for Non-degree Seeking Student. Non-degree seeking students are ineligible for all federal financial aid programs, **including the GI Bill** and are limited to enrolling in a maximum of 30 credit hours as non-degree seeking. Non-degree seeking students must submit an official copy of their previous college transcript(s) if necessary to verify prerequisites.

Dual Enrollment of High School Students

A high school student wishing to take courses at School of Mines should begin by contacting the Admissions Office at School of Mines and the Principal's Office or Guidance Office at the high school he or she currently attends to receive the high school's approval to participate. This approval should accompany the Board of Regents High School Dual Credit Admissions Application. Please refer to the legislative SDCL 13-28-37, enacted by the South Dakota Legislature in 1990. This bill states the following: "Postsecondary enrollment-Responsibility for cost-Failing grade eliminates eligibility. Any student enrolled in grades ten, eleven, and twelve may apply to an institution of higher education or a postsecondary vocational education institution as a special student in a course or courses offered at the institution of higher education or postsecondary vocational education institution. The student shall obtain the school district's approval of the post-secondary course or courses prior to enrolling. If approved, the student shall receive full credit toward high school graduation as well as post-secondary credit for each postsecondary course. The resident school district may pay all or part of the tuition and fees for a course approved for credit toward high school graduation in accordance with this section. The student is responsible for any tuition and fees not paid by the resident school district and for any other costs involved with attending a postsecondary institution. If a failing grade is received in a postsecondary course under this section, the student receiving the failure is no longer eligible to enroll for post-secondary courses under this section."

Additional Admissions Policies and Practices

Institutions authorized by the Board of Regents to offer graduate study programs may admit students selected according to regulations established by each faculty. A graduate student will be defined as one who has been accepted into a graduate school.

All entering students seeking an associate or baccalaureate degree must provide valid Enhanced ACT scores, SAT/SAT-I scores, or must take the ACCUPLACER examination in the areas of writing skills, mathematics, and reading. All non-degree seeking students enrolling in English and mathematics courses must provide Enhanced ACT scores, SAT/SAT-I scores, or must take the ACCUPLACER examination in the areas of writing skills and mathematics.

Students transferring within the South Dakota Board of Regents system will be allowed to transfer their placement test scores and continue their sequence of courses in English and/or mathematics.

The placement process will be consistent for all Regental institutions.

Applications and Procedures

- A. **Application for Tuition and Fee Reductions and Scholarships Established by the Legislature**
Students should contact the Admissions Office for information on eligibility for tuition and fee reductions and scholarships established by the Legislature.
- B. **Application Submission**
An applicant for admission must submit the required application for admission and the necessary official transcript or transcripts and other required documents to the Office of Admissions (501 E. Saint Joseph Street, Rapid City, SD 57701).
- C. **Records Required**
Applicants who are twenty-one (21) years of age or younger must submit Enhanced ACT (or SAT-I) results, an official high school transcript, if a high school graduate, or proof of GED and an official transcript for all previous college work as part of their application. **In those cases where an admissions decision can be made based on the student's academic record, the requirements to submit ACT/SAT-I results may be waived.** Applicants who are older than twenty-one (21) years of age and who do not have valid ACT / SAT-I exam results (**taken within the last 5 years**), or who have not taken the exams are not expected to take the exam. However, they are required to submit an official high school transcript, if a high school graduate, and an official transcript for all college work. Applicants should also submit any other records, data, or letters required to support eligibility for admission, including competency test scores. SAT scores will be converted to ACT equivalencies according to a conversion table approved by the Board of Regents. Note: An official transcript is one that bears the original seal and signature of the official in charge of records at that institution and is sent directly from the institution.
- D. **Preadmission Immunization Requirements**
In accordance with state law, every student (graduate and undergraduate) who has been admitted to a post-secondary institution - either public or private - in the state of South Dakota **who meets established criteria is obliged to demonstrate immunity to measles, mumps, and rubella.** Relevant criteria (the key factors which drive the need for compliance) are delineated below:
1. Age: students born on or after January 1, 1957 must comply; those born prior to this date are excused.
 2. Course schedule: students who register for two or more credit-bearing classes - and at least one course involves face-to-face contact on a weekly basis for multiple weeks - are obliged to comply. This includes participation at all campuses, centers (including University Center, Capital University Center, and West River Higher Learning Center), and off-campus meeting locations.
 3. Academic background: students who have completed prior collegiate coursework *in the state of South Dakota* (initiated prior to July 1, 2008) are excused from compliance. Note: credits earned through distance learning, dual credit agreements, and exam/validation do not qualify.
 4. Acceptable evidence of immunity to *each disease* includes:
Immunization record which specifies administration of two doses of vaccine; Medical laboratory report that verifies presence of disease-specific antibodies in the blood (i.e., positive blood titer); and /or, documentation of disease state as diagnosed by a qualified physician.

The law recognizes that special circumstances may preclude ability to demonstrate compliance as detailed above. Those students for whom vaccination presents a threat to health/well-being and those who adhere to a religious doctrine that opposes immunizations may petition for a permanent exemption or temporary waiver as appropriate. Forms are available at: <http://sdmines.sdsmt.edu/studentlife/forms>. Please note: the statute does *not* allow for philosophical objections.

Freshman Checklist

- Submit application for admission.
- Enclose non-refundable application fee with application for admission (\$20.00).
- ACT or SAT I scores must be on file in the Admissions Office.
- Applicants must arrange to have an official copy of their high school transcript forwarded to the Office of Admissions after their junior year is complete and grades have been recorded. A final official transcript will also be necessary in order to verify final class rank, graduation, and satisfaction of the minimum course requirements for admission to South Dakota Public Higher Education Institutions. Transcripts can be sent to the Admissions Office by mail to: 501 E. Saint Joseph Street, Rapid City, SD 57701 or through an approved electronic third party vendor at: etranscripts@sdsmt.edu.
- Prospective freshmen desiring scholarship consideration must be accepted for admission and have completed the scholarship application prior to January 15.

Transfer Checklist

- Application for admission.
- Non-refundable application fee of \$20.00.
- An official transcript from each postsecondary institution attended. (Sent by the institution attended directly to the Office of Admissions **via postal deliver at:** 501 E. Saint Joseph Street, Rapid City, SD 57701 **or approved electronic third-party vendor at:** etranscripts@sdsmt.edu).
- All applicants must submit a high school transcript, or other proof of graduation from high school; or, if not a high school graduate, they must submit copies of their high school equivalency/GED scores.
- Applicants younger than twenty-one (21) who have completed less than 24 semester credits of college work must submit official copies of SAT I or ACT scores in addition to the above documents.

Applicants who will be less than 21 years of age at the beginning of the semester for which they are applying for admission, and who have completed less than 24 credit hours of college coursework must **also meet freshman admission requirements**.

Transfer applicants will be notified of their admission status at School of Mines shortly after all of the above documents have been submitted.

Undergraduate International Student Admissions

To be considered for undergraduate admission, international applicants must meet the following criteria. See Application Requirements below for details.

1. Applicants should have a minimum GPA of 2.75 at both the secondary (high school) and post-secondary (college) education levels.
2. Applicants must be proficient in English; please review details about our English requirements.
3. Applicants must provide an acceptable SAT or ACT score. Math sub-scores should be a minimum of 590 on the SAT or 25 on the ACT.

Application Requirements

The following items are necessary before a request for admission can be processed. If admitted, the form I-20 is usually necessary for admission to the United States for college attendance. The REQUIRED items for admission are listed below.

1. **Completed online application** and the State of South Dakota application fee of \$20.00. (Your application will not be processed until the \$20.00 fee is paid.)
2. **Academic credentials (translated into English).** This includes high school transcripts and transcripts from ALL post-secondary institutions attended.
 - OFFICIAL TRANSCRIPTS
 - For a transcript to be considered official, it must be sent directly from the issuing institution to our university.
 - All copied documents must be certified by an official school or government seal as originals or certified photocopies.
 - ALL documents must be in a sealed envelope with university or government agency stamping across the seal.
 - If you are attending an institution in the US and they have the official documents, they may send certified copies of these documents to us in the same manner.
 - All documents become the property of the South Dakota School of Mines & Technology.
 - ELECTRONIC TRANSCRIPTS - there are 3 ways we can receive electronic official college transcripts.
 - <http://www.parchment.com/>
 - <http://www.studentclearinghouse.org/>
 - eSCRIP-SAFE, the Global Electronic Transcript Delivery Network, supplements traditional paper transcripts by providing high schools, colleges, universities, and third-party recipients with a network through which official transcripts are delivered in a secure and trusted environment. Delivery is instantaneous, fully trackable, and most importantly, easy to use. Business processes need not change and joining the network is simple.
3. **English proficiency** - This is usually the TOEFL or IELTS; please review details about our English requirements.
4. **SAT or ACT scores** - Math sub-scores should be a minimum of 590 on the SAT or 25 on the ACT. If the SAT or ACT is not readily available in your country, alternatives will be considered. Scores must be sent directly from the issuing organization. The website for SAT is: <http://sat.collegeboard.org/home> and the website for ACT is: <http://www.actstudent.org/>.

SD Mines ACT code: 3922

SD Mines SAT code: 6652

5. Evaluation of your academic credentials.

- i. Evaluation of academic credentials are completed AFTER a student is fully admitted. All syllabi, in English, should be submitted at the time the transcript is sent.
- ii. An academic department may require submission of academic credentials to an independent credential evaluation service, the charge for which will be paid by the student. SDSM&T only accepts credential evaluations from these specified organizations.
 - a. Educational Credential Evaluators, Inc. (ECE) at <https://www.ece.org/> (order a course report or catalog match)
 - b. World Education Services (WES) at <http://www.wes.org/> (order a course by course report)

Financial information documenting ability to pay.

If you are admitted, the United States Citizenship and Immigration Service (USCIS) requires that a US college or university issuing form I-20 or DS-2019 establish that the person to whom the form is issued is able to pay all educational and incidental expenses (see Costs for International Students). The I-20 or DS-2019 form will not be issued without appropriate financial documents. Financial information is not required for admission.

Deadlines

For first time freshman only: to be considered for merit-based scholarships, you must be ADMITTED by January 15 and complete the scholarship application. The online scholarship application will be available beginning November 1 and is due by January 15. You must be accepted for admission to SD Mines prior to completing the scholarship application.

SD Mines does not have a specific deadline for admission. However, all international applicants should submit their documents at least three months prior to the start of the semester they plan to enroll. This will allow time to apply for the appropriate visa and to make travel arrangements.

Applications and Other Forms

Apply Online (preferred method)

Application form (paper) - Online applications preferred, but paper application forms may be requested by sending an email to international@sdsmt.edu.

Electronic University Consortium

In fall 2000, the Electronic University Consortium (EUC) came online at: www.WorldClassEducation.org. The EUC provides a single connection point for distance education offerings from South Dakota School of Mines and Technology, as well as our sister institutions South Dakota State University, University of South Dakota, Dakota State University, Northern State University, and Black Hills State University. Students from throughout the world are able to register for and participate in classes offered via the Internet from any of these institutions. Courses offered by two-way interactive video and by correspondence are also listed on the EUC.

Current Reduced Tuition Programs for Non-Residents

The current non-resident tuition rate is \$385.30 per credit hour. For more information, contact the Cashier's Office at (605) 394-2372 or e-mail cashier@sdsmt.edu.

Reduced tuition is available for certain non-resident first-time freshmen, new transfers, and international students. Students already enrolled in the public university system prior to summer 2006 will not be eligible for the new non-resident rate. Tuition assistance is also available to National Guard members, ROTC cadets, South Dakota State Employees, certain elementary and secondary school teachers and vocational instructors, and persons 65 years of age or older. Graduate students who hold a state contract for an assistantship or fellowship may also be entitled to special reduced tuition and should contact the Graduate Education Office at (605) 394-1206. For current tuition information see the website: www.sdsmt.edu.

Minnesota Reciprocity

Students from Minnesota can currently come to the South Dakota School of Mines and Technology at a comparable rate to Minnesota resident tuition under the Minnesota Reciprocity agreement. To apply, or for more information: www.sdbor.edu/policy/5_FinanceBusiness/documents/5-5-1.pdf.

Nebraska Reduced Tuition Program

Beginning in the fall of 2018, new students who reside in Nebraska will qualify to receive tuition and fees at the in-state rate.

Colorado Excellence Award Program

Beginning in the fall of 2018, new students who reside in Colorado and meet the minimum requirements of a 3.5 unweighted GPA and a 27 ACT Composite or 1280 SAT Math and Reading Combined score will qualify to receive tuition and fees at the in-state rate.

Western Undergraduate Exchange Program (WUE)

The WUE tuition rate is 150 percent of the resident rate: \$369.05 per credit hour compared to \$246.00. For more information, contact the Cashier's Office at (605) 394-2372 or e-mail cashier@sdsmt.edu.

The reduced tuition rate is available for non-resident first-time freshmen and new transfers from Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, Utah, Washington, Wyoming, and the Commonwealth of the Northern Mariana Islands. Students already enrolled in the public university system prior to summer 2016 will not be eligible for the WUE rate. For more information: <http://wiche.edu/wue>.

Hardrocker Heritage Award

Nonresident freshman and transfer students who have at least one parent or legal guardian who earned a degree from South Dakota School of Mines and Technology qualify to receive tuition and fees at the in-state rate. Currently enrolled students who are not eligible for this program. To apply, or for more information:

<http://www.sdsmt.edu/Admissions/Financial-Aid-and-Scholarships/Hardrocker-Heritage-Award/>

Other Reduced Tuition Programs

Tuition assistance is also available to National Guard members, ROTC cadets, South Dakota State Employees, certain elementary and secondary school teachers and vocational instructors, and persons 65 years of age or older. Graduate students who hold a state contract for an assistantship or fellowship may also be entitled to special reduced tuition and should contact the Graduate Education Office at (605) 394-1206. For current tuition information see the website: www.sdsmt.edu.

Resident and Nonresident Classification of Students

Purposes of Classification

Each person who applies for admission to a university shall be classified as a resident or a nonresident for admissions and tuition and fees purposes (See Policy 2:3 Admissions and Policy 5:5 Tuition and Fees).

Information, Burden of Establishing Residency, Reclassification

- A. The decision shall be based upon information provided by the student and all other relevant information.
- B. The institution is authorized to require such written documents, affidavits, verifications, or other evidence as are deemed necessary to establish the residence of the student, including proof of emancipation, adoption, or appointment of a guardian.
- C. Students have the burden of establishing residency by clear and convincing evidence.
- D. Students may appeal the original classification decision by written petition to a reviewing body appointed by the chief executive officer of the institution within thirty (30) days after registration for that semester. The recommendation of the reviewing body shall be submitted to the chief executive officer for a decision. The decision of the chief executive officer shall be final, but students who have been classified as nonresidents retain full rights to petition the executive director of the South Dakota Board of Regents for reclassification after they have remained in South Dakota continuously for 12 months.
- E. After twelve (12) months continuous presence in South Dakota, students who were initially classified as nonresidents may petition for reclassification.
- F. Petitions for reclassification shall be filed with the Executive Director, who shall act upon them. The Executive Director shall report his disposition of such petitions to the Board at its regularly scheduled meetings. These reports shall be summarized in a manner consistent with the Family Educational Rights and Privacy Act.
- G. If a petition for reclassification is granted, the reduced tuition rate shall become effective with the first semester or session following the date on which the petition is granted. Students who fail to request resident

status prior to a particular semester or session or to pursue a timely appeal shall be deemed to have waived any claim for reduced tuition for that semester or session.

- H. A student or prospective student who knowingly provides false information or refuses to provide or conceals information for the purpose of improperly achieving resident student status is subject to the full range of penalties, including expulsion, provided for by the Board of Regents.

Establishing Bona Fide Residency

For tuition purposes, residence means the place where a person has a permanent home, at which the person remains when not called elsewhere for labor, studies or other special or temporary purposes, and to which the person returns at times of repose. It is the place a person has voluntarily fixed as the person's permanent habitation with intent to remain in such place for an indefinite period. A person, at any one time, has but one residence and a residence is not lost until another is gained.

- A. The residence of an un-emancipated person younger than twenty-one (21) years of age follows that of the parents or of a legal guardian who has actual custody of the person or administers the property of the person. In the case of divorce or separation, if either parent meets the residence requirements, the person shall be considered a resident.

Students who enter the state for the predominant purpose of attending a Board institution and who are under the custody of a guardian in fact, that is, a person who has been designated in writing by the students' parents or legal guardian to serve as their attorney in fact for purposes related to the individual unemancipated student's affairs, may file a residency petition with the Board at the time of admission.

- B. A person shall be classified as a resident student if the person has continuously resided in South Dakota for at least 12 consecutive months immediately preceding the first scheduled day of classes of the semester or other session in which the individual registers in the Regental system; except that unemancipated students whose parents established their residence in South Dakota for reasons not predominantly related to qualifying their children for reduced tuition, may be classified as residents, notwithstanding the fact that they have not resided in South Dakota for the requisite 12 months prior to the first scheduled day of classes.

If it appears that the parents of a person properly classified as a resident student under the provisions of this section have removed their residence from South Dakota, the person shall be reclassified to the status of nonresident unless the parents have been residents for the 12 months immediately preceding such removal. However, no such reclassification is effective until the beginning of a semester next following the removal.

- C. Physical presence in South Dakota for the predominant purpose of attending an institution of higher education controlled by the Board does not count in determining the 12-month period of residence. Absence from South Dakota to pursue postsecondary education does not deprive a person of resident student status.
- D. A person once properly classified as a resident student shall be deemed to remain a resident student so long as remaining continuously enrolled in the Regental system until the person's degree shall have been earned, subject to the provisions of (B) above.
- E. International students whose visas permit them to establish domiciles in the United States or its territories or protectorates may qualify for resident tuition in the same manner as United States citizens.

Factors to Be Considered When Determining Whether Students Have Entered South Dakota for the Predominant Purpose of Attending a Public University

- A. The following factors shall be considered relevant in evaluating a requested change in a student's nonresident status and in evaluating whether the person's physical presence in South Dakota is for the predominant purpose of attending an institution of higher education controlled by the Board:
- The residence of an un-emancipated student's parents or guardians;
 - The site of the source of the student's income;
 - To whom a student pays taxes, including property taxes;
 - The state in which a student's automobile is registered;
 - The state issuing the student's driver's license;
 - Where the student is registered to vote;
 - The marriage of the student to a resident of South Dakota;
 - Ownership of property in South Dakota and outside of South Dakota;
 - The residence claimed by the student on loan application, federal income tax returns, and other documents;
 - Admission to a licensed profession in South Dakota;
 - Membership in civic, community, and other organizations in South Dakota or elsewhere; and
 - The facts and documents pertaining to the person's past and existing status as a student.
- B. The existence of one or more of these factors does not require a finding of resident student status, nor does the nonexistence of one or more require a finding of nonresident student status. All factors shall be considered in combination, and resident student status may not result from the doing of acts which are required or routinely done by sojourners in testate or which are merely auxiliary to the fulfillment of educational purposes.
- C. The fact that a person pays taxes and votes in the state does not in itself establish residence.
- D. Students who do not meet the requirements of this policy may still be classified as residents if their situation presents unusual circumstances and their classification is within the general scope of this policy.

Retention of Residence While in Military Service

In determining the residence status for tuition purposes, it is presumed that persons in military service who list South Dakota as their "home of record" and who, immediately upon release, return to South Dakota to enter college shall be classified as residents.

Tuition and Fees - Undergraduate

Tuition and Fees

The following rates became effective May 4, 2018 and are subject to change by Board of Regents action. For current information see the website: www.sdsmt.edu or www.sdbor.edu

Tuition and Fees	Resident	Non-Resident
Undergraduate on-campus per semester credit	\$249.70	\$391.10*
Graduate on-campus per semester credit	\$324.85	\$652.00
General Activity Fee - per credit	\$ 48.45	\$ 48.45

*Does not include Minnesota rates. For more information, please refer to Minnesota Reciprocity information.

See text below for the description of discipline fees.

Resident Hall Rent - per semester	Resident	Non-Resident
Single Occupancy	\$2,229.40	\$2,229.40
Double/Triple Occupancy	\$1,866.00	\$1,866.00
Quad	\$2,086.90	\$2,086.90
Deluxe Quad	\$2,239.60	\$2,239.60

* For residency information, contact the Admissions Office or refer to Board of Regents Policy 3:2.

Reduced tuition is available for non-resident first-time freshmen, new transfers, and international students. Those undergraduate students will qualify for a rate of 150 percent of what residents pay. Students already enrolled in the public university system prior to summer 2006 will not be eligible for the new non-resident rate. Reduced tuition is also elementary and secondary school teachers and vocational instructors, and persons 65 years of age or older. Graduate students who hold a state contract for an assistantship or fellowship may also be entitled to special reduced tuition and should contact the Graduate Education Office at (605) 394-1206.

*Students from Minnesota can currently come to the South Dakota School of Mines and Technology at a comparable rate to Minnesota resident tuition under the Minnesota Reciprocity agreement. To apply, or for more information please review Board of Regents Policy 5:5:1.

Fees

Application Fee

Non-refundable charge upon initial application for admission. \$20 undergraduate and \$35 graduate.

General Activity Fee

A fee is assessed for each state-funded course for activities such as student organizations, cultural events, homecoming, student government, student newspapers, wellness center, intramurals student health services, and the Surbeck Student Center operational and debt expenses. The allocation of general activity fees is recommended to the president by students on the General Activity Fee Committee, and the president is the approving authority on how these fees are spent.

Discipline Fees

The Discipline Fees are assessed by course prefix. They are used to support incremental costs of instructional equipment and other operating costs, including salary enhancement for the benefit of students enrolled in higher cost disciplines.

Credit by Examination Fee

This \$90.75 fee is charged for each course in which a student seeks credit by examination.

International Student Fee

All international students enrolled on campus with an F-1 or J-1 visa shall be charged the International Student Fee each semester they are enrolled. This includes degree-seeking students, English as a Second Language (ESL) students, and foreign students enrolled under a cooperative agreement with a foreign institution.

Vehicle Registration Fee

All motor vehicles parked on campus must be registered with the Campus Safety Office. Contact this office at (605) 394-2251 for options, amounts, and appropriate display of parking permit or <http://www.sdsmt.edu/Campus-Services/Facilities/Campus-Parking/>.

Transcript Fee

A transcript of credits is an authentic copy of the student's academic record. The charge for each transcript is \$9.00.

Payment Process

All tuition and fees are required to be paid in full or other financial arrangement made with the Cashier's Office no later than August 31, 2018 for fall 2018 classes and January 17, 2019 for spring 2019 classes. For the student's convenience, electronic bill and payment services are provided. If no financial arrangement is made by these dates, a late charge will be assessed on the next day. Examples of other financial arrangements may include payment plans, deferments for financial aid, or third party payments. (For a deferment for financial aid, contact the Financial Aid Office.) Since summer semester add/drop periods vary, check with the Cashier's Office for final financial arrangement dates for add/drop courses. If no financial arrangement is made, enrollments shall be cancelled.

Late Payment Charge

If tuition and fees are not paid before established due dates, late payment charges will be assessed. If financial obligations are not met when due, student may be administratively withdrawn for the university.

Indebtedness

A student who is indebted to the university and does not satisfy financial obligations when due may be withdrawn after notice from the university and will not be permitted to register or receive a transcript of grades or a diploma until the indebtedness is paid. This applies to indebtedness for university tuition, room, board, fees, financial aid, and fines, but not to student organizations. If a student's account is placed with a collection agency, the student will be responsible for all collection costs, attorney's fees, and any other costs necessary for the collections of any unpaid balance.

Debit Card System

The South Dakota School of Mines Grubby Gold Card is a money management system activated through each student's ID card. This account is similar to a checking account or a debit card. When you present your card to make a purchase at participating locations, on and off-campus, the amount will be immediately deducted from your account. Currently, Grubby Gold is accepted at select beverage and snack machines in Surbeck Center and in the dorms, at the bookstore, Hardrock Café, Java City, washers and dryers in the dorms, copy machines at Surbeck Center and select vendors off campus.

To add money to your Grubby Gold account or check account balances and account history, just create a Grubby gold account online. Look for the link at: grubbygold-sp.blackboard.com/

Self-register by using your student ID number and your name as it is printed on your student ID. If your parents, family or friends know your student ID number, they can also add money to your Grubby Gold account by using the guest deposit feature online.

Refunds

Withdrawal Refunds Information

Students who withdraw, drop out, or are expelled from School of Mines within the add/drop period (first 10 percent of term, commonly referred to as the census date) receive a 100 percent refund of tuition and course-related fees. Students who withdraw, drop out, or are expelled from the university after the add/drop period for the enrollment period for which they are assessed charges may be entitled to a refund of tuition, fees, and other institutional charges calculated through 60 percent of the enrollment period. The refund shall be determined by computing the percentage of an enrollment period remaining after the date of withdrawal times the tuition, fees, and other institutional charges originally assessed the student.

A student's withdrawal date is:

1. The effective date used for students withdrawing from the University is the date that the withdrawal process is initiated in the Office of the Registrar. This notice must be given by the student using the appropriate forms. A withdrawal will not be finalized until a student has returned the completed form to the Office of the Registrar and it has been processed or the student drops all of their courses on WebAdvisor.
2. In the instance the withdrawal form is not submitted as instructed above, the institution in its discretion and in accordance with Board of Regents Policy 5:7, will determine the effective date of the withdrawal
3. Dates for withdrawing from the university will be proportionally adjusted for summer terms of instruction.
4. Or, at School of Mines option, the student's last documented date of academically related activity.

Federal Financial Aid Recipients: The U.S. Department of Education requires institutions to use the Return of Title IV Funds policy for students withdrawing from school and who are receiving Federal Title IV student financial aid. Title IV funds refers to the federal financial aid programs authorized under the Higher Education Act of 1965 (as amended) and includes the following Federal Student Aid programs: Subsidized and Unsubsidized Stafford Loan, Parent PLUS Loan, Grad PLUS Loan, Perkins Loans, Pell Grant, Academic Competitiveness Grant (ACG), National Science and Mathematics to Retain Talent Grant (SMART), Supplemental Educational Opportunity Grant (SEOG) and any other Federal Aid program enacted by Congress. Students are advised to review the information located at: www.sdsmt.edu/FinAid/T4-WD/

See Policies and Definitions page for further information regarding withdrawals.

Financial Aid - Undergraduate

Overview

The following information is intended to be a brief overview of the financial aid process and programs at the School of Mines. More up to date and detailed information is available on our website at: www.sdsmt.edu/FinAid.

Students at the School of Mines benefit from nearly \$24 million in various forms of financial assistance from both within and outside the university. It is clear that many college students find it necessary to supplement their personal and family financial resources in order to attend college. SD Mines administers a comprehensive financial aid program to enable capable, qualified, and needy students to finance their college education with both need-based aid (grants, subsidized loans, and work-study) and non-need based aid (scholarships, outside agency assistance, unsubsidized loans, private alternative loans, Parent PLUS loans, etc.). However, the student should still be prepared to pay for a portion of college costs through savings from employment, and parents of dependent students are expected to assist with the student's cost of education to the extent to which they are able.

The School of Mines gives priority on a first come, first served basis in the awarding of the Federal Supplemental Educational Opportunity Grant (SEOG) and Federal Work-Study (FWS) to students whose Free Application for Federal Student Aid (FAFSA) has been received by the FAFSA processor on October 1 and thereafter until funds are exhausted. Students who are eligible for the Federal Pell Grant, Federal Direct Loan, Federal Direct Grad PLUS Loan and/or the Federal Direct Parent PLUS Loan are awarded without regard to when the FAFSA is received for the school year. The Financial Aid Office generally begins the Federal Student Aid awarding process for new incoming freshman by late February.

I. General eligibility requirements for awarding Federal Student Aid

- A. Must have applied and been fully admitted to the School of Mines as a degree-seeking student.
- B. Complete a new **FAFSA** each year to determine eligibility for Federal Student Aid Programs.
- C. Be a U.S. citizen or eligible non-citizen.
- D. Not be in default on a federal student loan or owe a federal student grant repayment.
- E. Male students born after December 31, 1959, must register with Selective Service.
- F. Follow the steps for reviewing your aid award at: www.sdsmt.edu/FinAid/FA-Award-Notification and for finalizing the aid awarded to you at www.sdsmt.edu/FinAid/FinalizeAid/
- G. Complete the online School of Mines *Additional Information Form* contained within the links in item F in which you should report any aid assistance received that is not listed on the aid award, which includes, but is not limited to scholarships, Voc-Rehab, BIA/Tribal Assistance, etc.
- H. Be enrolled as a full-time student to receive the full amount of aid awarded (indicate enrollment status on the **Additional Information Form** noted above) and notify the Financial Aid Office if the planned and/or actual enrollment changes at any time.
- I. Must maintain Satisfactory Academic Progress toward the completion of a School of Mines degree. Students who meet or exceed the standards as stated at: www.sdsmt.edu/FinAid/T4/SAP can be assured of continued eligibility until the completion of their degree or until maximum loan/Pell limits have been reached, whichever comes first.
- J. Complete the Attendance Confirmation via WebAdvisor at least two weeks prior to every semester of attendance at SD Mines.

II.

The School of Mines is a full participant in the Federal Student Aid Programs. Specific information about each program is available at: www.sdsmt.edu/FinAid/. The student's School of Mines aid award on WebAdvisor identifies the aid he or she is being awarded and provides information for finalizing the processing of the award.

- A. are gift aid based on financial need.

1. **The Federal Pell Grant** is awarded to students who have not yet completed their first bachelor's degree and is based on a federal formula used to analyze the information provided on the FAFSA.
 2. **Federal Supplemental Educational Opportunity Grant (SEOG)** is awarded to Pell Grant eligible students based on the availability of funds.
- B. provide an opportunity for students to borrow money for educationally related expenses. However, like any loan, they must be repaid according to the provisions of the promissory note. First time loan recipients are required to complete Loan Entrance Counseling as shown at: **www.sdsmt.edu/LoanEntrance**.
1. **The Federal Direct Subsidized and Unsubsidized Loan** programs are obtained from the Federal Government as the lender. For the Subsidized Direct Loan, the Federal Government pays accrued interest on behalf of the student during periods of at least half-time enrollment or other eligible deferment periods. However, with the Unsubsidized Direct Loan, the Federal Government does not pay the accrued interest on behalf of the student while enrolled in school or during available deferment periods, with interest accrual beginning at disbursement. For both the Sub and Unsub Direct Loans, payment on the principal balance is required to begin six months after the student graduates or is no longer enrolled at least half-time. Current interest information is available at **studentaid.ed.gov/sa/**
 2. **The Federal Direct Grad PLUS Loan** is available to graduate students (masters and Ph.D.) who have exhausted their eligibility for the Unsubsidized Stafford and Direct Loan programs.
 3. **The Federal Direct Parent PLUS Loan** is borrowed by the parent on behalf of the parent's dependent student.
- C.
1. **Federal Work-Study awards** are based on financial need as determined by the results of the FAFSA and the awarding policy of the School of Mines. Employment opportunities are available both on and off campus with off campus positions focused on community service. Eligible students will be sent a Work-Study Application and after review of the applications, work-study awards will be finalized.
 2. **Other employment opportunities** are available for students who were not awarded Federal Work-Study. Some positions are on-campus and others are submitted by local employers or the South Dakota Job Service and are regularly posted in the Surbeck Student Center: www.sdsmt.edu/Campus-Life/Student-Resources/Student-Employment/.
- D.

In order to be considered for incoming freshman scholarships at the School of Mines, prospective students must complete an online scholarship application. The online scholarship application will be available beginning November 1 and is due by January 15. You must be accepted for admission to SD Mines prior to completing the scholarship application. The online admission application is available at: **www.sdsmt.edu/Admissions/Apply/**. All incoming freshmen accepted for admission will need to fill out the online scholarship application to be considered for incoming freshman scholarships. At the School of Mines, students apply for and are awarded a "scholarship" without regard for specific donor funding. In July, the Financial Aid Office then assigns the scholarship recipients to the various donors based on the donor-specific criteria.

1. **Freshman Scholarships**
SD Mines strives to offer scholarships to as many academically talented incoming freshmen as possible with renewable support for three additional years provided the recipient is a full time student who completes at least 24 SD Mines credit hours per academic year*, maintains at least a 3.0 SD Mines cumulative grade point average (CGPA), and continues progress toward completion of their degree.
2. **National Merit Finalist Scholarships**
SD Mines is one of a select number of universities which are a sponsor institution of the National Merit Scholarship Corporation (NMSC). Through a combination of NMSC Scholarship and SD Mines National Merit Finalist Scholarship, a \$3,000 scholarship

renewable for three additional years is available to National Merit Finalists who notify the NMSC via the PSAT/NMSQT that the School of Mines is their first-choice college by March 1st. Being full time, completing a minimum of 24 SD Mines credit hours per academic year*, maintaining at least a 3.00 SD Mines CGPA and continuing progress toward completion of their degree are requirements for renewal.

3. **Annual Scholarships**

One year scholarships are awarded to current students. Current students are required to complete an application for annual, non-renewable scholarships awarded by the SD Mines Scholarship Committee that are based on academic performance at the School of Mines and donor specific scholarship criteria. Information on availability of the online scholarship application is provided to students in late October (with a submission deadline of midnight MDT on December 31) for scholarships to be awarded for the following academic year. Scholarship recipients must maintain full time enrollment (must enroll in a minimum of 12 School of Mines credit hours) for each semester of the award and maintain the CGPA as required by the scholarship. If the scholarship is major specific, the recipient must maintain enrollment in the appropriate coursework needed for that major.

* An exception may be granted for up to two degree-related courses at any of the South Dakota Board of Regents (SDBOR) institutions. Students should contact the Financial Aid Office to obtain approval. Students who would like to take classes at a non-SDBOR institution and use SD Mines' financial aid should contact the Financial Aid Office with regards to a potential consortium agreement.

E.

Current students majoring in Mechanical, Civil, Electrical or Computer Engineering must complete a department scholarship application through their applicable department to be eligible for department scholarships. Incoming freshmen interested in Metallurgical, Electrical or Computer Engineering are encouraged to fill out an application through their applicable department to be eligible for department scholarships. We recommend all students interested in department scholarship opportunities to contact their Department Head for more scholarship information. Scholarship applications are not required for the other undergraduate degrees at SD Mines.

F. **Graduate Student Support**

Graduate students should contact the Graduate Education Office at the School of Mines regarding available fellowships.

III. **Review Billing Statement**

The Student Accounts Office will send an e-mail notification to the student's Mines e-mail account informing him or her of availability to access their billing statement before each semester and whenever there is a change to the student's account. Please review the statement and pay attention to the amount owed and the payment guidelines set by the Business Office. Be advised that work-study awards will not appear on the billing statement.

IV.

With the exception of Federal Work-Study, which is paid monthly, financial aid is credited to the student's account. If the aid applied to the student's account exceeds institutional costs applied to their account, he or she will either receive a cash disbursement (refund check) in the mail or the funds will be deposited directly to the student's bank account via Direct Deposit. Students should contact the Student Accounts Office for further information on the Direct Deposit option. In the event there are delays in disbursing the aid, students should always have enough money available to meet immediate expenses they might incur at the beginning of each semester, such as the purchase of books and supplies or security deposits for off-campus housing.

V.

At times it may be necessary to take classes at one of the other SDBOR universities in order to complete the student's degree requirements. Other than to sign up for classes through their School of Mines WebAdvisor

account, no special arrangements need to be made in order to include those classes in their enrollment status for financial aid purposes at the School of Mines. However, if the student plans to take classes at a non-Board of Regents school, they must contact the Financial Aid Office to determine if classes taken there can be used to fulfill degree requirements at the School of Mines and to determine their overall semester enrollment status.

School of Mines scholarship and fellowship recipients must get advisor approval for their non-SD Mines courses prior to the start of the semester in order to use non-School of Mines credit hours to meet the full time School of Mines credit hour requirement for scholarship and fellowship disbursement. Advisors must send an e-mail to the Financial Aid Office verifying the non-SD Mines courses count towards the student's degree program.

VI.

The School of Mines does not offer courses via correspondence. However, students are advised to discuss possible options with the Financial Aid Director for receiving assistance to help pay for this type of coursework taken at another eligible institution.

VII.

Students who are interested in receiving federal financial aid for the summer term must submit a School of Mines Summer Aid Application (available after March 31) to the Financial Aid Office and complete the FAFSA for the coming school year. Their aid award will be based on a summer, fall, and spring academic year. As a result, receiving aid for the summer will directly impact the amount of aid available for the fall and spring semesters. Per SDBOR policy, the number of credit hours taken during the summer term in order to maintain a particular enrollment status (full, 3/4, 1/2 or less than half time) is the same as the fall and spring semesters. Generally, students must carry at least a half-time course load of 6 credits for undergraduate and 4.5 credits for graduate students to be eligible for summer financial aid. Specific exceptions are available to graduate students enrolled in 2 research or dissertation credit hours.

VIII.

Due to circumstances that may or may not be beyond the student's control, it may become necessary to withdraw from all classes prior to the end of a particular semester. Depending on the withdrawal date, the student may be entitled to a full or partial refund of tuition and fees, tablet PC rental, and if contracting with the university, for room and board.

To initiate the official withdrawal process, the student needs to first go to the Office of the Registrar, Room 216 of the O'Harra Building. If that is not possible, he or she may call (800) 544-8162, Ext. 2400 or local at (605) 394-2400. In the event that the student ceases attendance without notifying the Office of the Registrar, or simply never attends classes and receives a 0.00 GPA for the semester, the university has the option of considering the withdrawal date to be 1) the midpoint of the period of enrollment; 2) the last documented date of academically related activity; or 3) if he or she did not notify the Office of the Registrar due to circumstances beyond his or her control, the date relative to that circumstance, whichever is later. It is important that a student clearly state that he or she is withdrawing from all classes. Dropping a class and withdrawing from all classes have a different impact on a student's status with the university. If enrolled at more than one campus within the SDBOR university system, the student must inform the Office of the Registrar staff whether the intent is to withdraw from all campuses or just the School of Mines.

Beginning in the 2015-16 academic year, students are only allowed to drop a total of six classes (not a total withdrawal) while pursuing their undergraduate academic degree. The seventh class in which a student drops will be recorded as an "WFL" rather than a "WD". Courses dropped prior to the 2015-16 academic year are not counted in the six class maximum. Please refer to the Withdrawal Grades Policy and Deadline.

Students who have requested a Financial Aid Consortium Agreement between the School of Mines and a non-SDBOR institution and are using those credit hours to determine their enrollment status for financial aid, must be withdrawing from both institutions in order for their withdrawal from the School of Mines to result in a refund calculation. Please review the withdrawal procedures outlined elsewhere in the college catalog.

Information is also available on our website at: www.sdsmt.edu/FinAid/T4-WD. Examples are provided regarding what refund a student could expect to receive based on when he or she withdraws.

IX.

Requests for additional information should be directed to the Financial Aid Office, South Dakota School of Mines and Technology, 501 E Saint Joseph St., Rapid City, SD 57701-3995, or call locally (605) 394-2274, or toll free (877) 877-6044 or via e-mail at FinancialAid@sdsmt.edu.

Policies/Definitions

All academic policies listed herein are based on applicable South Dakota Board of Regents policies (referenced as SD BOR Policy) or Academic Affairs Council Guidelines (referenced as AAC Guidelines) and procedures. As such, readers should review the referenced policy and/or guidelines for more specific information when applicable.

Academic Amnesty

Eligibility:

The goal of academic amnesty is to respond to the academic needs of matured individuals as they develop newly identified potential. Through the application of academic amnesty, the student's prior academic record can be excluded from current work under certain conditions.

To be eligible, the student must:

1. be an undergraduate, full-time or part-time, degree-seeking student at one of the universities in the South Dakota Regental system;
2. not have been enrolled in any postsecondary institution for a minimum of three consecutive terms including only Fall and/or Spring prior to the most recent admission to the home institution. Exceptions may be granted in rare cases only by the Board of Regents Vice President for Academic Affairs upon recommendation by the Vice President for Academic Affairs;
3. have completed a minimum of 24 graded credit hours taken at any Regental university with a minimum grade point average of 2.0 for the 24 credit hours after the most recent admission to the home institution;
4. not have earned a baccalaureate degree from any university;
5. not have been granted any prior academic amnesty at any Regental university;
6. submit a formal Academic Amnesty Petition to their home university following the procedures established by the university.

Conditions:

1. Academic amnesty does not apply to individual courses. Academic amnesty may be requested for either (a) all previous post-secondary education courses, or (b) all previous post-secondary education courses at a specific institution, or (c) a specified time period not to exceed one academic year (fall/spring).
2. Academic amnesty, if granted, shall not be rescinded.
3. Courses for which academic amnesty is granted will:
 - a. remain on the student's permanent record.
 - b. be recorded on the student's undergraduate transcript with the original grade followed by an asterisk (*)
 - c. not be included in the calculation of the student's grade point average because no credit is given.
 - d. not be used to satisfy any of the graduation requirements of the current degree program.
4. Academic amnesty decisions will be made by the student's home institution and will be honored by all other institutions within the South Dakota Regental system.
5. Universities outside of the South Dakota Regental system are not bound by the academic amnesty decisions made by the South Dakota Regental system.
6. Regental graduate programs and graduate professional schools may consider all previous undergraduate coursework when making admissions decisions.

The form to appeal for academic amnesty can be found at the following

URL: www.sdsmt.edu/Academics/Registrar/forms/

Academic Calendar

Institutions of higher education, under control of the South Dakota Board of Regents, shall operate on a common academic calendar with common periods during the summer term and the fall and spring semesters at each institution when classes are not in session. Academic calendars shall be designed a minimum of two years in advance with annual extensions recommended to the Executive Director by the Council of Presidents and Superintendents no later than the May meeting.

Academic Freedom (Student) Rights

The School of Mines and the South Dakota Board of Regents have a longstanding commitment to protecting those freedoms of inquiry and learning that are essential to the expansion of knowledge and the correction of error. This includes protections for student freedom in learning. In its relevant parts, Board of Regents policy, which applies to the School of Mines and to all other public universities, provides the following:

- A. To secure student freedom in learning, faculty members in the classroom and in seminar should encourage free and orderly discussion, inquiry and expression of the course subject matter. Student performance may be evaluated solely on an academic basis, not on opinions or conduct in matters unrelated to academic standards.
- B. Students should be free to take reasoned exception to the data or views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.
- C. Each institution shall establish an academic appeals procedure to permit review of student allegations that an academic evaluation was tainted by prejudiced or capricious consideration of student opinions or conduct unrelated to academic standards. These procedures shall prohibit retaliation against persons who initiate appeals or who participate in the review of appeals.
- D. Students are responsible for maintaining standards of academic performance established for each course in which they are enrolled. (See SD BOR Policy 1:1).

Academic Recognition for Undergraduate, Part-Time Students

Undergraduate, part-time students taking fewer than 12 credits per term may be designated for academic recognition for part-time students at the end of the fall and spring terms. The academic recognition for part-time students' designation is determined by the home university. The academic recognition for part-time students' designation does not appear on the transcript.

To be awarded the academic recognition for part-time students' designation, students must meet the following guidelines:

- Students must have completed at least 12 credits hours prior to the current semester at one or more Regental institution.
- The student must have earned at least 3 and up to 11 credit hours of 100-699 level courses during the term.
- Students must achieve a System Term GPA of at least 3.50.
- Students with F, I, U, RI or RU grades are not eligible regardless of System Term GPA attained.

Academic Terms Defined

The School of Mines operates a fall, spring, and summer term. Fall and spring shall operate on a semester basis. Summer term begins the day after spring semester ends and continues until the day before fall semester begins.

A semester shall consist of a minimum of 15 weeks. The number of class days in a given semester shall be inclusive of those days set aside for registration, assessment/performance testing and final examinations but exclusive of holidays and days set aside for new student orientation. New student orientation may be concurrent with or prior to registration.

Academic guidelines require that all courses offered for credit must involve a minimum of 15 contact hours over 3 instructional days for each credit hour awarded.

Courses offered by distance education should have equivalent standards, rigor, student outcomes, substance and assignments as courses offered by face-to-face means. Distance education courses may be scheduled on a semester basis and require that students complete learning experiences on a particular timeline (i.e. each week). The required length for a distance education course is determined by course expectations and scheduling. The student will conclude the course upon completion of course requirements. Typically, a one credit hour course lasting for a semester equates to 45 hours of effort by the student.

Placement Testing - ACCUPLACER

A mandatory placement procedure for mathematics and English is used at all Regental universities in the state. The instruments and criteria used for other mandatory placement are at the discretion of each institution.

The ACT is the required initial test used to place students who attend a South Dakota regental university into their mathematics and English courses. A student can be placed in classes via the ACT sub-scores for math and English, or, for more accurate placement, using the College Board Accuplacer test, which is administered at South Dakota universities such as the School of Mines or online via remote proctor. The Accuplacer test is administered on a computer and takes approximately 30 to 40 minutes for each section (math, writing, and reading). Students who need to take the Accuplacer test should sign up for and attend an Accuplacer Day by going to the New Student Checklist from the Mines homepage or contact the Testing Center at 605-394-2428.

Students will need to take all or part of the Accuplacer test if:

1. They have not taken the ACT within five years from date of enrollment and have not taken and passed any college level English or math courses.
2. They have a Math Index Score below 1150.
3. They have a Math Index Score of 1150 or higher and are seeking higher math placement than College Algebra.
4. They have a Math Index Score of an 1150 or higher and want to challenge their course placement. Students are permitted to take Accuplacer twice and have the option of taking the higher of the two scores. Be advised that a deficiency warrants serious contemplation and students should consider the class that best reflects the requirements of math success. At School of Mines, advanced math, especially calculus, is a mainstay in the curriculum, regardless of major.
5. They scored 17 or less on their ACT English.

Accuplacer results are designed to assist the institution in placing students into appropriate math and English courses or, if necessary, into developmental or preparatory courses. We caution students that successful completion of a high school course (e.g., trigonometry) does not guarantee that this course has been mastered at the college level. Placement is confirmed by passing the appropriate Accuplacer test area. See section on Math Index Score and math placement below.

Alcohol and Drug Policy

SD Mines adheres to the SDBOR Alcohol and Drug Policy found in the SD BOR Alcohol and Drug Policy (see SD BOR Policy 3:4) which states the following is prohibited: The unauthorized manufacture, sale, possession, use, or consumption of alcohol, marijuana, or controlled substances by students...The unauthorized possession of any drug paraphernalia. Please note that being in the presence of alcohol is considered a violation of the SD BOR alcohol policy. The complete alcohol and drug policy can be found in the SDBOR Student Code of Conduct. The Community Standards Office is responsible for enforcement of the SD BOR Code of Conduct, including the Alcohol and Drug Policy. Residential students should consult the Residence Life Handbook for further information on alcohol and drugs in the residence halls.

Anti-Harassment Policy

It is the policy of SD Mines that harassment not be tolerated. It distracts the harasser, the victim, and others from the tasks of the workplace and academic environment; it undermines morale and the psychological well-being of the victim; and it leads to expensive litigation and to possible liability. The university has no tolerance for harassment, whether it occurs on or off campus, during or after normal business hours, at work-related social functions, or during business-related travel. Any employee or student violating this policy will be subject to disciplinary action up to and including termination or dismissal. SD Mines Anti-Harassment policy IV-A-20, the South Dakota Board of Regents Sexual Harassment policy 1:17, and the South Dakota Board of Regents Human Rights Complaint Procedure 1:18 can be reviewed in their entirety at: <http://sdmines.sdsmt.edu/hr/rules>, or contact the Affirmative Action Officer/Title IX-EEO Coordinator in the Human Resources Office.

Attendance Policy

Every student is expected to attend each lecture or laboratory session for which he or she is scheduled. The faculty has allowed no system of authorized "cuts." A student who fails to attend classes regularly must satisfy such requirements as the instructor in a course may prescribe.

Audited Courses and Registrations for No Credit

The outside preparation of auditors is entirely voluntary. Their participation in classroom discussions and examinations, and the minimum attendance requirements are subject to arrangements with the instructor of the course being audited. Failure to meet these arrangements will be cause for changing the grade in the course from "AU" to "W." An auditor is allowed neither credit nor a grade for the course even if the auditor satisfactorily passes the final examination of the course. An audited course cannot count toward the definition of a full-time load for purposes of securing financial aid nor for establishing eligibility to compete in intercollegiate contests. An audited course may not be used to qualify for a reduced tuition rate, but will be counted toward any upper limits on the number of credit hours a student may carry, and will be counted in determining requirements for paying campus fees.

A course taken for no credit but with a grade will be treated the same as an audited course except that the student will be expected to prepare and participate in the course to the same extent as all other students. The grade awarded will not be counted in the student's grade point average.

The request to audit a course or to enroll with no credit must be made at the time of the drop and add period by written petition to the Office of the Registrar. The petition has no effect on the tuition charges for a course.

The form to request an audit can be found at the following URL: <https://www.sdsmt.edu/Academics/Registrar/Forms/>

Undergraduate Pass-Fail Option

1. Any undergraduate student with a minimum cumulative GPA of 2.00 at South Dakota School of Mines and Technology is eligible to elect one free elective course per semester on a pass or fail basis. Courses taken under the Pass/Fail option cannot be used to satisfy the sixteen (16) credit hours of humanities/social science requirement for the bachelor of science degree.
2. The student shall notify the Office of the Registrar in writing of his or her request that the course be graded on a pass or fail basis. Only the Office of the Registrar and the student's advisor are to be notified of the intention of the student to be graded on a pass or fail basis. A student will have the option during the drop and add period of each semester to change from pass or fail to traditional grading, or vice versa.
3. The instructor will report the student's grade based on the college's regular grading system. If a grade of "D" or better is recorded, the student will receive a "Satisfactory," a grade of "U" will be recorded as a "Fail," and the "U" grade will count in calculating credits attempted.
4. Credits earned under this option may be used toward a student's graduation requirements, if appropriate and applicable, but only if a grade of "S" is recorded. A passing grade will be recorded as "S" and will not be used in the calculation of the student's GPA. A course taken on a pass or fail basis will not be converted, after a grade has been recorded, to a traditional grade for the purpose of improving a GPA.
5. The pass or fail option shall apply only to the student's first registration in a course.

The form to request the pass/fail option can be found at the following

URL: <https://www.sdsmt.edu/Academics/Registrar/Forms/>

Campus Clearing Policy

All graduating students are responsible for return of all college property, library books, keys, etc., and payment of all financial obligations to the college before their diplomas will be released.

Catalog of Graduation for Undergraduate Students

- The catalog of graduation begins with the summer term and ends with the subsequent spring term.
- Every student is required to have a catalog of graduation. New and transfer students are assigned the catalog in effect at the time of their initial enrollment at the university from which they are seeking a degree. Students may elect a catalog of graduation that is later than their initial catalog but may not elect a catalog of graduation that is earlier than their initial catalog.
- In order to receive a degree, a student must meet the program requirements listed in his/her catalog of graduation.
- Students who discontinue enrollment at any Regental university for more than two consecutive semesters are assigned the catalog in effect at the time of their re-enrollment as their catalog of graduation.
- Students are considered to be in continuous enrollment for purposes of the catalog of graduation so long as any break in enrollment at any Regental university is for two or fewer consecutive semesters (excluding summer) and students maintain their degree seeking status at the same Regental university.
- Students who change their degree seeking status from one Regental university to another Regental university are assigned the catalog of graduation that corresponds to the term they are admitted to their new degree granting university.
- Students who are not currently enrolled and who petition to graduate based on coursework previously completed at a Regental university are assigned the catalog in effect during the term they wish to graduate.

Cheating (Academic Integrity) Policy

The South Dakota Board of Regents has clearly defined those acts that constitute violations of academic integrity (SD BOR Policy 2:33 - Student Academic Misconduct and SD BOR Policy 3:4 - Student Code of Conduct). These acts include, but are not limited to cheating and plagiarism; full definitions are found in the above referenced policies. These acts of dishonesty violate the ethical values the university works to instill in all members of the campus community. The instructor of record for each course is responsible for clarifying the academic integrity standards for that course within the course syllabus.

Academic Misconduct Process

The process for resolution of academic misconduct cases is determined by SD BOR 2:33. The Community Standards Office is responsible for the adjudication of all academic integrity cases.

Classification of Undergraduate Students

All undergraduate students will be assigned one of the following admissions categories:

1. Regular: An admitted, enrolled student, who is pursuing a degree at the School of Mines.
2. Special: An enrolled student who has not been admitted, and is not pursuing a degree, will be permitted to accumulate more than thirty (30) hours only on an exceptional basis. Special students do not qualify for federal student aid or institutional scholarships.

An Admissions Office review is required in order for a student to move from one admissions category to another.

Freshman, sophomore, junior, or senior classification of undergraduate students is based on accumulated credits for courses passed:

- 0 to 29.99 credits - Freshman
- 30 to 59.99 credits - Sophomore
- 60 to 89.99 credits - Junior
- 90 or more credits - Senior

A full-time undergraduate student is defined as a student who is enrolled in at least twelve (12) credit hours during an academic term. An academic term is defined as fall, spring, and summer. A student on a cooperative education assignment who is registered for CP (Co-Op) credit shall be considered to have full-time status.

See the graduate student general information section of this catalog for the definition of a full-time and half-time graduate student.

Community Standards

Through its rigorous academic programs and co-curricular activities, SD Mines is committed to developing informed and responsible scientists and engineers who behave ethically, value a global perspective, and accept the duties and responsibilities of citizenship.

Policies & Sanctioning

As a student at SD Mines, you are responsible for abiding by policies provided by the SD Board of Regents (BOR), the university, and specific departments/areas as applicable to your situation. As such, it is important for you to be familiar with where policies are posted. The following links provide you access to policies which govern your conduct as School of Mines students.

- Community Standards Office
- University Policies
- BOR Policies
- Student Code of Conduct
- Academic Misconduct Policy

Computer and Network Usage Guidelines and Policy

Students, faculty, staff and others affiliated with School of Mines are provided access to computing and networking services for use in academic pursuits and other activities that advance the goals of the institution.

All computer users must be properly registered and authorized through Information Technology Services (ITS). In accepting authorization to use computing or networking services, a user agrees to comply with all applicable federal, state and local laws and all regulations and policies of both the university and the Regents of the state of South Dakota.

Individuals should guard their electronic identity. Choose secure passwords, and never reveal them to anyone. Individuals can be held liable for activity carried out by others using their accounts. Keep all passwords and access mechanisms secure and private. Facilities and network services are provided for use only by account holders, not their family members or friends.

Theft, misuse, or other abuse of computing or networking services will not be tolerated and may result in loss of computer and/or network privileges, disciplinary action, criminal or civil prosecution.

To connect to the wireless network, we require a wireless equipped laptop and Windows XP/Vista operating system. Instructions on how to connect are located on the ITS website: <http://its.sdsmt.edu>.

All guidelines and terms of use apply to ALL computer usage, wireless as well as wired desktop and laptop.

Unacceptable activities include, but are not limited to:

- Unauthorized file access or file transfer;
- Use of another individual's identification, password, or account;
- Use of computing or networking facilities that interferes with the work of another student, faculty member, or university official, or with the normal operation of computers, terminals, peripherals, or networks at the university or elsewhere;

- Making, acquiring, or using unauthorized copies of computer software or violating terms of applicable software licensing agreements;
- Use of computer or network systems that result in violation of copyright law;
- Running, installing, or distributing any program intended to damage or to place excessive load on a computer system or network;
- Attempting to circumvent data protection schemes through any mechanism, including unauthorized access or tampering with security;
- Electronically posting or distributing materials resulting in any violation of existing laws, regulations, or university or Regental policies;
- Attempting to monitor or tamper with another person's electronic communications, or reading, copying, changing, or deleting another person's files or software without the explicit agreement of that person; and
- Providing access to computer accounts, Internet connectivity, electronic mail, or other significant services to persons not authorized for use of School of Mines facilities, resources, or network services. For example, students with computers hosted on the residence hall network may not permit family or friends to use these services. Although these guidelines cover most aspects of the policy, a full copy of the current university policy on acceptable use of computing and network resources may be found at: <http://its.sdsmt.edu/student/8408/>.

Cooperative Education Program

A partnership with business, industry, and government agencies, the Cooperative Education Program provides students with opportunities to apply their classroom learning to "real world" work experiences in industry. Co-op students are hired by employers to work in positions related to their major. Minimum GPA and other co-op eligibility requirements vary among employers. Interested students should contact the Career Center or their department's Cooperative Education Coordinator. Students are responsible for securing their own co-op positions and are encouraged to register with the Career Center for assistance with identifying and applying for co-op opportunities. After accepting a co-op offer, students are to inform the Career Center of their co-op employer, salary, and dates of employment.

During their co-op work experience, students are expected to apply knowledge learned in the classroom and to grow professionally through development of their interpersonal, communication, teamwork, and workplace etiquette skills.

1. **Academic Credit:** 1 to 3 credits. Prerequisite: Permission of instructor. Credit is available for each semester or summer work experience upon approval by the departmental Cooperative Education Coordinator. Students must satisfy departmental requirements in order to earn credit for their co-op. Requirements include a written report of the work experience and an employer's evaluation of work performance. Because the work performed by a student working full-time while on co-op is equivalent to the workload of a full-time student, a student on co-op who is registered for CP credit shall be considered to have full-time status.
2. **Administration:** The Cooperative Education Steering Committee is comprised of the departmental Cooperative Education Coordinators, the Provost and Vice President for Academic Affairs, and the director of Career Center. The committee is responsible for developing cooperative education industrial or business experiences; assisting students with identifying co-op opportunities; maintaining contact with cooperative education employers; and conducting an on-going evaluation of the program. For additional information, contact the Career Center (605) 394-2667 or visit: <http://careers.sdsmt.edu/>.

Course Numbering System

Tuition for courses numbered 000 through 499 will be assessed at the undergraduate rate for all students.

Pre-College Courses

001-099 Pre-college, remedial skills, special improvement (non-degree credit)

Undergraduate Courses

100-199 Freshman level

200-299 Sophomore level

300-399 Junior level

400-499 Senior level (may be dual listed with 500 level graduate course)

Tuition for courses numbered 500 through 899 will be assessed at the graduate rate for all students.

Graduate Courses

500-599: Entry level graduate (may be dual listed with a 400 level undergraduate course and may include limited enrollments by undergraduates)

600-699: Graduate level (undergraduate enrollment only by exception)

700-799: Graduate level (Graduate students only)

800-899: Doctoral and post-doctoral level (Doctoral and post-doctoral students only)

Experimental Courses

Experimental courses can be offered for a maximum of two (2) times before formal approval is received, but they must be reported through the system curriculum approval process.

Course Overloads

A normal student load is 18 credit hours or fewer. An overload is a course load in excess of 18 credit hours.

To register for an overload, students must consult with their academic advisors and department heads. To be eligible for a course overload, students must have completed at least 30 semester hours of college credit with a minimum GPA of 2.7. With advisor and department head approval, students may request up to 21 total credit hours per semester. Overloads in excess of 21 total credit hours in a semester or requested prior to completing 30 semester credit hours are discouraged but may be requested and must be approved by the Provost/Vice President for Academic Affairs or his or her appointed designee.

The form to request a course overload can be found at the following

URL: www.sdsmt.edu/Academics/Registrar/Forms/

Course Retake Policy

The registration retake policy defines how many times a student may register for (take) a course.

The retake policies approved by the BOR are as follows:

1. A student will be allowed a total of three takes for undergraduate courses (course numbers of 001 to 499) for which credit is only counted toward graduation once. The student must petition in writing to the Vice President for Academic Affairs to be permitted to take an undergraduate course more than three times.

Students wishing to appeal must complete the Application for Academic Appeal form that is available at the Office of the Vice President for Academic Affairs or can be downloaded from:

<http://www.sdsmt.edu/Campus-Life/Student-Resources/Applications-and-Forms/> or

<https://www.sdsmt.edu/Academics/Registrar/Forms/>. At the undergraduate level only the LAST attempt (take) of the course will count toward graduation and into the grade point average calculations.

2. A student will be allowed a total of two takes for graduate courses (course numbers of 500 or above) for which credit is only counted toward graduation once. The student must petition the graduate dean for permission to take a graduate course more than two times.
3. A student will be allowed unlimited takes for an undergraduate or graduate course for which credit toward graduation may be received more than once (e.g., Cooperative Education, Independent Study, Thesis). All takes will count into grade point average calculations. Individual departments/majors may limit the number of credits allowed toward graduation in certain courses. Students should check with their advisor.
4. The Audit (AU) grade is the only grade that will not be counted as a take of a course. All other grades, including Withdraw "W" grade, will count as a take of a course.
5. Transfer courses and non-courses (CLEP, credit by exam) will also count as a take of a course.
6. The count for retakes will begin with courses in which students are enrolled fall 2003. Takes of a course prior to fall 2003 will not be counted.

Credit Hours Definition

The amount of academic work scheduled or "carried" by a student is measured in terms of credit hours. A credit hour is three hours of in-class time and preparation combined per week for one (1) semester. A recitation or lecture is scheduled as one fifty-minute period plus two (2) hours of preparation for an average student per week per credit hour. Each credit hour of laboratory work is scheduled as one-hundred-ten to one-hundred-seventy (110 to 170) minutes per week. Laboratories scheduled for two (2) hours per credit hour are expected to require one (1) hour of work outside of the scheduled time per week per credit hour.

Credit Received through Validation Methods

Advanced Placement Program (AP)

Entering freshman students who have completed an honors course in high school and who have taken and successfully passed appropriate College Entrance Examination Board Advanced Placement test with a score of 3, 4, or 5 may receive course credit. (See AAC Guidelines 7.1)

College Level Examination Program (CLEP)

The South Dakota Board of Regents and its universities encourage high school student to pursue rigorous academic programs and to take advantage of opportunities available to them to earn college credit. The College Board's College Level Examination Program (CLEP) provides an opportunity to earn college credit. Colleges and universities award college credit for satisfactory performance on the CLEP examinations. Satisfactory performance on CLEP examinations can reduce the cost of college education by reducing the number of credits a student must take to complete the degree. You may not repeat an exam of the same title within three months of the initial testing date. CLEP exams may be taken to repeat F grades. The initial F grade will be used in the grade point average calculation.(See AAC Guidelines 7.3).

International Baccalaureate (IB)

School of Mines recognizes the rigor of IB courses and the IB Diploma Program and encourages students to complete higher level courses and exams when ready. Students who complete higher level courses and exams and obtain a score of five (5) or above will be considered for advanced placement credit in the corresponding courses. (See AAC Guidelines 7.7)

Credit by University Examination

The School of Mines faculty has adopted a policy to permit college credit by university examination. Any student enrolled in the college who has studied a subject independently or who has completed equivalent college level course elsewhere for which he or she is unable to get a transcript acceptable to this institution may request a special examination to establish credit under the conditions specified below (See AAC Guidelines 7.4):

1. The student must consult his or her advisor and the head of the department in which the course is offered, who will conduct a preliminary survey of the work in which the student claims to be prepared and will determine whether an examination is warranted, what topics it should cover, and what credit may be expected.
2. After determining eligibility to take an examination the candidate pays a per-subject fee at the Office of Student Accounts/Cashier's Office and then secures the appropriate form from the Office of the Registrar.
3. If the student successfully completes the examination, the permanent record will show "Credit by Examination" with a grade of "EX". No entry will be made on a permanent record if the examination is failed.
4. Credit by examination is not permitted if the student has previously completed the course for collegiate credit.

Credit by Other Validation Methods

Credits earned through validation methods other than nationally recognized examinations (that is, university administered tests and verification like military credit or prior learning) are not allowed:

1. To exceed 30 credits for baccalaureate degrees
2. To exceed 15 credits for associate degrees
3. If the student previously visited or is currently registered for the class
4. For any graduate level courses (exception for some programs).

Dean's List Designation

Undergraduate, full-time and part-time students may be designated for the Dean's List at the end of the fall and spring terms. The Dean's List designation is determined by the home university and is based on a student's total course registrations for academic credit for the term from any Regental university. The Dean's List designation does not appear on the transcript.

According to the South Dakota Board of Regents policy, undergraduate full-time students must meet the following guidelines to be awarded Dean's List designation:

- Students must have earned a minimum of 12 credit hours in courses numbered 100-699 during the term.
- Students must achieve a System Term GPA of at least 3.50.
- Students with F, I, U, RI, or RU grades are not eligible regardless of System Term GPA attained.

Dropping a Course Deadline

Please see the Academic Calendar for "Last day to drop classes" for deadline information.

Double Major in Science Programs

An undergraduate student who wishes to qualify for a double major in two science programs must complete all requirements for both academic programs of study. This means earning a minimum of 120 credits for one science major plus all additional unique credits for the second science major. The System General Education requirements must be met once. A student will receive a single diploma with both majors notated under a single Bachelor of Science degree.

The dual major option at the School of Mines applies only to science programs (non-engineering programs). Students seeking to qualify for a second engineering degree should consult the section on Two Bachelor of Science Degrees from SD Mines.

Working on dual undergraduate degrees can have implications for students receiving Federal Student Aid and especially for those receiving assistance from the Federal Pell Grant program. Students seeking to qualify for a dual major designation should arrange to complete them both in the same semester. Whether or not a student applies for graduation, once a student has completed a first bachelor's degree, he or she is no longer eligible for Pell Grant, Supplemental Educational Opportunity Grant (SEOG) and other potential Federal Aid programs currently available or available in the future. If you have questions, please schedule an appointment with David Martin or Erin Richards in the Financial Aid Office.

Dual Use of Credit

Many high school students complete college-level courses while enrolled in high school. School of Mines encourages talented high school students to extend their educational background in this manner. South Dakota law provides that students in grades 10, 11 and 12 may enroll in higher education as a special student in a course or courses offered with the school district's approval, and these courses may be applied to high school graduation requirements. See Admission procedures for further information.

Enrollment in Courses

A. Undergraduate Courses (001-499)

1. All undergraduate and graduate students enrolling at Regental universities in courses numbered 001-499 shall be admitted as undergraduate students (either-degree seeking or non-degree seeking) and registered at the undergraduate level. For all undergraduate and graduate students enrolling at Regental universities in courses numbered 001-499, the courses shall be recorded on the transcript at the undergraduate academic level and included in the calculation of all undergraduate grade point averages.
2. When an undergraduate course is used on a converted credit basis (transferred for one level to another) to meet graduate plan of study requirements at Regental universities, the course shall be recorded on the transcript at the undergraduate academic level with the credit hours approved for the course and then duplicated at the graduate level through an internal transfer policy (Refer to BOR policy 2:5.16). At the undergraduate level, the credit is included in the calculation of the undergraduate institutional grade point average and the undergraduate cumulative grade point average at the full credit rate. At the graduate level, the credit is included in the calculation of the graduate institutional grade point average and the graduate cumulative grade point average at the converted credit rate (transferred for one level to another).
3. Undergraduate courses required as prerequisites in preparation for registration in graduate courses shall be recorded on the transcript at the undergraduate level and will not be duplicated at the graduate level because the courses are not a part of the Regental graduate plan of study.

B. Graduate Courses (500-899)

1. All undergraduate and graduate students enrolling at Regental universities in courses numbered 500-899 shall be admitted as graduate students (either degree seeking or non-degree seeking) and registered at the graduate level. For all undergraduate and graduate students enrolling at Regental universities in courses numbered 500-899, the courses shall be recorded on the transcript at the graduate academic level and included in the calculation of all graduate grade point averages.
2. When a graduate course is used on a converted (transferred for one level to another) or actual credit basis to meet undergraduate degree requirements for a Regental accelerated program, the course shall be recorded on the transcript at the graduate academic level with the credit hours approved for the course and then duplicated at the undergraduate level through an internal transfer policy (Refer to BOR policy 2:5.16). At the graduate level, the credit is included in the calculation of the graduate institutional grade point average and the graduate cumulative grade point average at the full credit rate. At the undergraduate level, the credit is included in the calculation of the undergraduate institutional grade point average and the undergraduate cumulative grade point average at the converted (transferred for one level to another) or actual credit rate.

C. Undergraduate Students Taking Graduate Courses

Undergraduate students who have completed a minimum of 90 credit hours may enroll in a limited number of 500 level courses. The Vice President for Academic Affairs may grant an exception for enrollment in a 600 level course. The student shall pay graduate tuition and the courses shall be recorded on a graduate transcript. These graduate courses may apply to an undergraduate degree.

Excused Absences for School Sponsored Events

The faculty recognizes extracurricular activities to be a valued component of student development and education. When an activity results in a classroom absence, the faculty members have agreed to accommodate students involved in these activities in accordance with this policy.

Procedures:

1. Students who participate in recognized activities will notify their instructors prior to the absence.
2. Students will be given the opportunity to make-up any exams missed in the course of the absence.
3. Students will consult with their instructors regarding the make-up/submission of other graded activities that will be missed as a consequence of the absence.
4. Recognized activities are those determined by the advisor of the sponsoring School of Mines organization or the coach of the involved athletic team. If there are any questions, the advisor or coach should consult with the Vice President for Student Affairs or Athletic Director.
5. All other arrangements (if allowable) for absences not covered under this policy must be decided through consultation between the faculty member and the student, and/or under the guidelines of the class syllabus of the instructor.
6. Unresolved issues may be taken up following the established School of Mines Grievance Procedure for Students Policy III-A-31.

Recognized activities under this policy are determined by the School of Mines advisor/coach. Upon request or as a standard process the advisor/coach may send an e-mail notice verifying the event.

Family Educational Rights and Privacy Act (FERPA) of 1974 or Buckley Amendment

The purpose of FERPA is to protect the privacy rights of students from the indiscriminate collection, maintenance, disclosure, and release of personally identifiable student information, including information regarding student status or performance.

Under FERPA each current and former student at School of Mines has the following fundamental rights:

- The right to review and inspect the student's education records.
- The right to request the amendment of the student's education records that the student believes are inaccurate or misleading, and the right to a hearing if the request for amendment is not granted.
- The right to consent to disclosures of personally identifiable information contained in the student's education records, except to the extent that FERPA authorizes disclosure without consent.
- The right to file a complaint with the U.S. Department of Education concerning alleged failures by School of Mines to comply with the requirements of FERPA.

Students should be aware that these rights and privileges are available to them. Formal notification regarding FERPA is provided annually. An announcement covering information designated as Public or Directory Information is included on posters, in the Family Matters, First Year Information and Commuter Connection newsletters, and on the Academic and Enrollment Family Educational Rights and Privacy Act web page at: registrar.sdsmt.edu/. Directory information includes the student's name, local and permanent address, telephone listing, electronic mail address, photograph (e.g., year book photos), date and place of birth, major field of study, dates of attendance (including graduation date), grade level, enrollment status (e.g., undergraduate or graduate, full or part time), participation in officially recognized activities and sports, weight and height of members of athletic teams, degree, honors and awards received, and the most recent education agency or institution attended (previous to School of Mines). This information is critical to some

obligations and services performed by the university. Students have the right to request that such information concerning them be withheld. For a full description of FERPA, information regarding the location of students' educational records, and procedures at School of Mines for compliance with the law, please contact the Office of the Registrar. US government reporting requirements have been added for international students (F and J status). As a result of the regulations that became effective on January 1, 2003, the Family Educational Rights and Privacy Act (FERPA) is waived for F and J students in respect to these specific reporting requirements. The regulations will be strictly enforced by the appropriate bureau(s) within the US Department of Homeland Security (DHS) and information will be reported electronically to DHS via Student and Exchange Visitor Information System (SEVIS). The consequences to students for non-compliance with the new regulations are severe. Contact the director of the Ivanhoe International Center at Ivanhoe@sdsmt.edu for more information.

Final Examination Policy

SD Mines provides a policy for the administration of final examinations.

The faculty, recognizing that courses and programs of instruction differ substantially and that methodologies of instruction and evaluation remain the province of each instructor, does not seek to impose any mandatory final examination policy upon the constituent faculty of this institution. However, each faculty member is hereby encouraged to give the last examination (comprehensive or non-comprehensive) during the final examination week.

A five-day final examination period shall be scheduled by the registration officer. No special individual or departmental requests will be honored in constructing the final examination schedule.

The instructor or instructors for each course shall indicate to their department head whether or not they intend to give a final examination, the number of hours for the exam, and whether additional rooms are needed for alternate seating; requests for additional rooms can be honored only if rooms are available. No additions will be permitted once the schedule has been published. All final exam requests will be due from departments at the time course registry requests are due. The final version of the exam schedule will be published in the Course Listings bulletin.

Final exams in all laboratory courses and courses of one credit or less will be given during the last regularly scheduled class period of the semester. Final examinations for evening classes meeting after 4:30 p.m. will be held at the last meeting of the class during final exam week. Final examinations for all other courses are scheduled by the registration officer according to the regular class meeting time during the semester and must be given at the scheduled time; they may not be rescheduled or given prior to the start of the final examination period. Examinations will be held in the regularly scheduled classrooms unless instructors make special advance arrangements through the registration officer.

Instructors in multi-section courses may request a "common final examination" period if requests are made in advance. Rooms must be reserved with the registration officer for such exams in order to avoid conflicts.

Final exam periods will be one hour and 50 minutes each, although instructors may request a longer final exam period (two hours and 50 minutes) if needed.

If a student is scheduled for three or more examinations on any one day, the middle examination(s) of the day shall be rescheduled for this student by the instructor(s) upon the request of the student. The student will be required to make this request between the 10th and 15th day of classes.

Other than those events approved by the faculty of the SD Mines, final examinations will be the only events scheduled during the week of final examinations. Students having conflicts arising from participation in such scheduled events must see their professors at least one week prior to the examinations week to determine an equitable alternative to taking the examination at the scheduled time.

Instructors will submit all grades not later than three working days after the last day of final examinations for the term.

Please consult the Academic Calendar for the official final exam schedule.

Grade Point Average Definition

The following grade point averages are calculated each academic term (fall, spring, summer):

Institutional GPA-based on credits earned at a specific Regental university. Utilized to determine if degree requirements have been met and to determine honors designation at graduation.

System Term GPA-based on credits earned at any of the six Regental universities within a given academic term (fall, spring, summer). Utilized to determine minimum progression status.

Transfer GPA-based on credits earned and officially transferred from an accredited college or university outside the Regental system. When a letter grade that normally calculates into the grade point average exists for a non-academic course (e.g., credit earned via examination), it will be included in the transfer GPA.

Cumulative GPA-based on all credits earned by the student (transfer credit plus system credit). Utilized to determine minimum progression status, to determine if degree requirements have been met and to determine honors designation at graduation.

Calculation of grade point averages when undergraduate courses are repeated

When a course has been repeated for credit, all attempts will be entered on the transcript but the last grade earned will be used in the calculation of the cumulative grade point average (See also SD BOR policy 2:5.11).

Graduate Credit for Undergraduate Courses

Graduate credit for School of Mines seniors, per faculty adopted regulations: "An undergraduate student who has senior standing at School of Mines and is ranked in the upper one-half of the class, may petition the Dean of Graduate Education on a form provided by the Office of the Registrar for the purpose that a course be recorded on his/her graduate record."

The following conditions or limitations apply:

1. The student must attest that he/she is planning to continue work toward an advanced degree at the SD Mines, but must understand that the university is under no obligation to credit courses so attempted toward any advanced degree until a graduate program of study has been approved.
2. The course(s) must be numbered 500-699.
3. The extra courses should not create an overload upon the student.
4. Not more than twelve (12) hours of graduate credit taken as a School of Mines undergraduate may be applied toward an advanced degree at the SD Mines. Upon written justification by the head of the student's major department, the Dean of Graduate Education may approve a minor variance from this limit.

Intellectual Property Statement

The South Dakota Board of Regents has developed a policy on intellectual property that sets forth the principles and procedures through which the Board will balance those interests.

South Dakota Board of Regents employees who carry out or administer such instructional, research and service activities routinely produce works or make discoveries that may be subject to legal protection as intellectual properties.

The Board recognizes and affirms the public policy principle, woven into the very fabric of the United States Constitution by its framers, that creators of intellectual properties should obtain a fair return from the fruits of their inventiveness. It also recognizes and affirms the principle that the public should have a fair return on its investment in support of such creative efforts. (See SD BOR Policy 4:34)

Minimum Graduation Standards

To be awarded a baccalaureate degree, an associate degree or certificate a student must at a minimum have a cumulative GPA of 2.0 or higher.

Minimum Progression Standards

Minimum progression standards and related actions are based on the student's cumulative grade point average and system term grade point average.

1. **Good Academic Standing:** A student who meets or exceeds the cumulative grade point average requirements listed below is considered to be in good academic standing. The required GPAs are based on class level. Students who have taken more credit hours are expected to meet a higher GPA standard.

Class	Credit Hour Range	GPA Standard
Freshman	0-29.99	1.8
Sophomore	30-59.99	1.8
Junior	60-89.99	2.0
Senior	90+	2.0

2. **Academic Probation:** If a student's cumulative grade point average falls below the GPA standard for his/her designated class rank as listed above in any academic term (i.e. fall, spring, summer), the student is placed on academic probation for the following term.
 - a. While on academic probation the student must earn a system term grade point average that meets or exceeds the GPA standard required for their class level.
 - b. When a student on academic probation achieves a cumulative grade point average that meets or exceeds the GPA standard for his/her class level, the student is returned to good academic standing.
3. **Academic Suspension:** A student on academic probation who fails to maintain a term grade point average that meets or exceeds the GPA standard required for his/her class level is placed on academic suspension for a minimum of two academic terms.
 - a. A student on academic suspension will not be allowed to enroll for any coursework at any Regental university except when an appeal has been approved by the Regental university from which the student is pursuing a degree. An approved appeal granted by one Regental university will be

honored by all Regental universities. (Also refer to BOR Policy 2:3, Section C.9.7. Students on Probation/Suspension.)

- b. Only Academic Suspension will be entered on the student's transcript. Academic probation will be noted in the internal academic record only.
4. Students enrolling in the Regental system for the first time with prior credit, including internal and external transfer students and dual credit students, shall not be placed on probation by their designated home institution until they have been enrolled at a Regental university for one (1) academic term.

Name Change Policy

The Office of the Registrar accepts name changes for students who are currently enrolled and for previously enrolled students whose records are maintained in our official student information system. In order to process a name change within our student information system, we require the following:

1. **A certified copy of a court order or a marriage certificate;**
2. **or a dissolution decree reflecting the new name in full;**
3. **or current passport or other government issued proof of identification.**

A name change shall be processed in person using the Change of Name Form. Contact the Office of the Registrar for more information.

Please note that while the main student information system is updated immediately, not all databases that rely on information from the student information system update changes immediately. Some update nightly, some update weekly, some update only once per semester.

Re-admission following Withdrawal

A student who has withdrawn from the university may be readmitted in that same semester by permission of the Vice President for Academic Affairs if the student has paid the appropriate tuition and fees.

Refunds of Tuition and Fees for Dropped Course(s)

A student receives a 100 percent refund of tuition and per credit hour fees for dropped courses within the drop/add period. The drop/add period for standard and non-standard courses offered in a semester shall be the date the first 10 percent of the term ends or the day following the first class meeting, whichever is later. When calculating 10 percent of the term, breaks of five or more days are not included when counting the total number of days but Saturdays, Sundays and holidays are. Any course meeting during a standard semester which meets for less time than the standard semester shall be treated as a non-standard semester course for refund purposes. **No refund shall be provided for courses dropped after that time by other than administrative action.** Courses offered during summer school terms, correspondence courses, asynchronous internet courses, and all other academic calendar type courses with begin and/or end dates that are different from the officially adopted fall and spring terms are considered non-standard courses. BOR Policy 5.7

Registration

WebAdvisor will list specific course information before priority registration each semester. Courses listed may be canceled for insufficient enrollment. SD Mines reserves the right to change the class schedule and adjust the individual section enrollment as necessary.

Students may register for courses using WebAdvisor; however, if a section is closed or registration into a selected section is controlled, permission to enroll must be obtained from the academic program offering the course. Academic departments have their own processes for granting this permission. For some courses, the student must submit a completed and signed course permission of instructor form in person to the Office of the Registrar. **Students may not attend classes for which they are not registered.**

Students are responsible for registering properly and paying by the deadline. Students should confirm the correctness of their enrollments (including drop and add) via WebAdvisor. Incorrect enrollments may result in academic and financial penalties.

Students are responsible for tuition payments and grades received for all courses in which they are registered unless registration is canceled administratively because of suspension, dismissal, or termination; the section is canceled; or the student drops the course before the tuition liability begins. See the Academic Calendar or Office of the Registrar website for deadlines.

Registration Changes

All students will be assigned an academic advisor upon admission; thereafter, all course registrations and changes, other than withdrawal from the university, should be approved by the assigned advisor. Students may request advisor or major changes from the Office of the Registrar. The proper request forms can be found here: <https://www.sdsmt.edu/Academics/Registrar/Forms/>

1. Courses may be added or dropped on WebAdvisor.
2. Students may add courses to their schedules through the first 10 percent of the term. When calculating 10 percent of the term, breaks of five or more days are excluded but Saturdays, Sundays, and holidays are included.
3. The add/drop period is the time during which students may adjust their academic schedule for the term without financial or academic consequences. No refund is provided for courses dropped after that time, except by administrative action. The last day of the drop/add period for a course is designated as the census date for that course and is the official date for enrollment reporting for the course. The end of the drop/add period for standard (those that conform to the regular semester schedule) and non-standard courses offered in a semester shall be the date the first 10 percent of the term ends or the day following the first class meeting, whichever is later. The timeline for this may be found on the Academic Calendar, by **visiting the Office of the Registrar website, or the University Calendar**. Students may only add courses after the drop/add period with the approval of the University Registrar and requisite academic department via the appropriate forms from the Office of the Registrar.
4. Do not stop attending a class without dropping the course or an "F" will be recorded.
5. Students who want to drop a course who will fall below 12 credit hours should consult with Financial Aid to determine the financial aid implications.
6. Following fee assessment, the students are required to pay for all additional tuition and fees at the Student Accounts/Cashier's Office. Failure to pay may result in students being dropped from the sections that they added. It is the responsibility of the instructor in each class to check the class roll carefully during the first few weeks of each semester to be certain that all students attending a given class are listed on the class roll. Any student whose name does not appear on the class roll should not be permitted to attend that class and should be referred to the Office of the Registrar promptly for clarification of his or her status.

Software and Intellectual Rights

Respect for intellectual labor and creativity is vital to academic discourse and enterprise. This principle applies to works of all authors and publishers in all media. It encompasses respect for the right to acknowledgment, right to privacy, and right to determine the form, manner, and terms of publication and distribution.

Software Copyright Statement

SD Mines has obtained licenses from a variety of vendors to use their software on computers that are owned and controlled by the school. South Dakota School of Mines and Technology does not own this software or its related documentation and, in general, School of Mines does not have the right to reproduce such software or to permit its reproduction by others. Microsoft MSDN is the only exception. Please contact the ITS Help Desk for information regarding MSDN, helpdesk@sdsmt.edu.

School of Mines students, faculty, and staff shall use all software only in accordance with applicable license agreements. Centrally managed licensing agreements are on file in the Information Technology Service Office or the Business Office. Making, acquiring, or using unauthorized copies of computer software or other copyrighted materials may result in disciplinary or legal action as the circumstances warrant.

The following statement regarding intellectual property and the legal and ethical use of software was developed by EDUCOM, a nonprofit consortium of higher education institutions, which promotes the use of computing, networking and information resources in teaching, learning, scholarship, and research. School of Mines subscribes to the spirit of this statement, and strives to promote understanding and observation of it.

Student Appeals Policy

A procedure is provided for situations where a student feels that an institutional or Board of Regents policy affecting terms or conditions of enrollment or academic standing has been improperly applied. Students who believe that an academic evaluation has been unfairly applied should follow this procedure. (See SD BOR Policy 2:9)

Students who wish to discuss their situation and how this process applies should consult with the Vice President for Student Affairs and Dean of Students.

Transcript of Credits

A transcript of credits is an authentic copy of the student's academic record from each Regental university attended. The fee is \$9.00 per copy. A transcript must include all courses attempted. Transcripts are released on written request with the signature of the individual concerned or through Parchment. This order can be placed through Parchment or in person, by mail, or by FAX to the Office of the Registrar. Upon graduation each student is entitled to one complete transcript of the credits earned without charge.

Two Bachelor of Science Degrees from South Dakota School of Mines and Technology

An undergraduate student who wishes to qualify for a second bachelor of science degree must complete all requirements for both degrees granted.

To qualify for a second bachelor of science degree conferred by School of Mines, a student must complete all additional unique required courses for the second degree above the minimum 130 credits required for an engineering degree or the minimum 120 credits required for a science degree.

Additionally, a minimum of 30 semester credits must be completed above and beyond the 130 credits (required for an engineering degree) or the 120 credits (required for a science degree). This means 130 credits plus a minimum of 30 credits for two engineering degrees or 120 credits plus a minimum 30 credits for two science degrees. The residency requirement of a minimum of 30 credit hours completed at the institution granting the degree applies to both degree programs.

If pursuing two (2) bachelor of science degrees simultaneously, a student must report this intent to the Office of the Registrar. This action will initiate the assignment of an advisor in each discipline. If returning to school to pursue a second bachelor of science degree, a student should investigate possible financial aid implications by contacting David Martin or Erin Richards in the Financial Aid Office.

Qualifying for a second bachelor of science degree should not be confused with qualifying for a double major. See section on Double Major in Science Programs.

Undergraduate Grading System

Undergraduate grades will be assigned to the undergraduate academic level and to all courses and sections with course numbers ranging from 001 to 499. Plus and minus grades are not used.

A Exceptional

4.00 grade points per semester hour

B Above Average

3.00 grade points per semester hour

C Average

2.00 grade points per semester hour

D Lowest Passing Grade

1.00 grade points per semester hour

F Failure

0.00 grade points per semester hour

S Satisfactory

Does not calculate into any GPA

U Unsatisfactory

Does not calculate into any GPA

RI Incomplete (Remedial)

Does not calculate into any GPA

RS Satisfactory (Remedial)

Does not calculate into any GPA

RU Unsatisfactory (Remedial)

Does not calculate into any GPA

W Withdrawal

For undergraduate students, does not calculate into any GPA, no credit granted prior to fall 2015.

For graduate students, does not calculate into any GPA.

WD

For undergraduate students effective fall 2015, the first six (6) dropped courses after the last day to drop and receive 100% refund. WD grades do not calculate into any GPA.

WW

For undergraduate students effective fall 2015 doing a full university withdrawal. Does not calculate into any GPA.

WFL

For undergraduate students effective fall 2015, any individually dropped course after six (6) maximum WD grades assigned. 0.00 grade points per semester hour.

AU Audit

Does not calculate into any GPA

I Incomplete

Does not calculate into any GPA

IP In Progress

Does not calculate into any GPA

EX Credit by Exam

Does not calculate into any GPA

CR Credit

Does not calculate into any GPA

LR Lab grade linked to recitation Grade

O credit course

NR Grade not Reported by Instructor

Does not calculate into any GPA

NG No grade

O credit tracking course

TR Note for NSE/MEDT

Does not calculate into the GPA

Academic Amnesty*

Does not calculate in any GPA, no credit given *Letter grade followed by an asterisk indicates Academic Amnesty granted.

Incomplete Grade Request

An incomplete (I) grade may be granted only when all of the following conditions apply:

- a. A student has encountered extenuating circumstances that do not permit him/her to complete the course.
- b. The student must be earning a passing grade at the time the incomplete is necessitated. Anticipated course failure is not a justification for an incomplete.
- c. The student does not have to repeat the course to meet the requirements.
- d. The instructor must agree to grant an incomplete grade.
- e. The instructor and student must agree on a plan to complete the coursework as evidenced by the Incomplete Grade Contract.
- f. The coursework must be completed within one semester; extensions may be granted by the Vice President for Academic Affairs/Provost.
- g. If the student completes the course within the specified time, the grades that may be assigned are A, B, C, D, F, S, RS, RU, or U.
- h. If the student does not complete the course within the specified time, the grade assigned will be F (Failure) or U (Unsatisfactory) or RU (Remedial Unsatisfactory).

An in progress (IP) grade may be granted only when all of the following conditions apply:

- a. The requirements for the course (for every student enrolled in the course) extend beyond the current term.
- b. The extension beyond the current term must be defined before the class begins.
- c. The instructor must request permission to award IP grades for a course from their department head, and then approval must be obtained from the Vice President for Academic Affairs.
- d. A definite date for completion of the course must be established in the course syllabus.

An audit (AU) grade may be granted only when the student has elected the AU option on or prior to the census date of the term.

A credit (CR) grade may be granted only for non course credit that is not related to an examination or to equating transfer grades to the BOR grading system. This grade is not used for any Regental university courses.

An examination for credit (EX) grade may be granted only for non course credit validation obtained through a validation process. This grade is not used for any Regental university course.

A grade of NG will be used only with those course sections that are designated as Tracking/Program Sustaining (Q).

Remedial grades (RI, RS, RU) may be granted only for courses numbered 001 to 099.

S Satisfactory/Unsatisfactory (S/U) grade may be granted only when the entire course requires the S/U grade or the student has elected the S/U option on or prior to census date of the term.

Waiver Request

In extenuating circumstances students may request that a requirement stated in the academic policies of the institution or of the South Dakota Board of Regents be waived. Examples of such requirements include, but are not limited to, the limit on the number of times a course may be attempted, the time limits on completion of pre-general education and general education courses, the academic suspension policy, the proficiency exam policy, and the change of grade from an F to a W. Students wishing to appeal must complete the Application for Academic Appeal form that is available at the Office of the Vice President for Academic Affairs or can be downloaded from:
www.sdsmt.edu/Academics/Registrar/forms/.

Withdrawal Grades Policy and Deadline

Effective fall 2015, undergraduate students are allowed a maximum of six (6) dropped courses with a grade of "WD," if that action occurs anytime between the day after the census day for that course and the day that corresponds with the completion of 70 percent of the class days for that course. If an undergraduate student withdraws from the system during that time, a maximum of six (6) dropped courses are eligible to receive a grade of "WD." Unless it is a corequisite laboratory course section, any following dropped courses will receive a grade of "WFL."

Graduate students who drop a course shall receive a grade of "W" if that action occurs anytime between the day after the census day for that course and the day that corresponds with the completion of 70 percent of the class days for that course. Likewise, a graduate student who withdraws from the system during that time period also shall receive grades of "W" for all the courses in which he/she is registered.

For standard classes, the last day to receive a grade of "W" is determined by calculating 70 percent of the class meeting days in the term, counting from the first day of classes in the term and rounding up if the calculation produces a fractional value greater than or equal to 0.5.

For any non-standard course, the last day to receive a grade of "W" is based on the number of class meeting days for the course, using the method described above.

A notation of the date of withdrawal will be included on the student's transcript if he/she withdraws from the system.

If a student withdraws from a course after the time period specified above, a grade of "F" will automatically be assigned by the Office of the Registrar. (See SD BOR Policy 5:7.2)

Withdrawal from the University

The effective date used for students withdrawing from the University is the date that the withdrawal process is initiated in the Office of the Registrar. This notice must be given by the student using the appropriate forms. A withdrawal will not be finalized until a student has returned the completed form to the Office of the Registrar and it has been processed or the student drops all of their courses on WebAdvisor. In the instance the withdrawal form is not submitted as instructed above, the institution in its discretion and in accordance with Board of Regents Policy 5:7, will determine the effective date of the withdrawal. Dates for withdrawing from the university will be proportionally adjusted for summer terms of instruction. Effective fall 2015, if an undergraduate student withdraws from the university system from the day after census day through 70 percent of the class meeting days in the term, a grade of "WW" will be issued for all courses. The "WW" grade is not factored into the GPA and these courses are not included in the maximum of 6 undergraduate dropped courses with a grade of "WD."

For graduate students, complete withdrawal from the university from the day after census day through 70 percent of the class meeting days in the term results in the assignment of "W" grades unless the professor-in-charge has previously assigned a final grade. A withdrawal from the university must be initiated in the Office of the Registrar. A withdrawal from the university will be processed only when all courses at all Regental universities are being dropped by a student.

If a student withdraws from the university after completion of 70 percent of class days, grades of "F" automatically are assigned by the Office of the Registrar in all courses for which the student was enrolled unless a final grade has previously been issued by the course instructor. In the event that a final grade has not been assigned, consideration may be given to extenuating circumstances that may warrant the assignment of a grade of "W" or "WD." Should such extenuating circumstances exist, students wishing to appeal must complete the Application for Academic Appeal form that is available at the Office of the Vice President for Academic Affairs or can be downloaded from www.sdsmt.edu/Academics/Registrar/forms/.

Such appeal must be filed within one term after the term in which the withdrawal occurred.

Graduation Requirements - Undergraduate

Application for Graduation and Commencement

An Application for Graduation and Commencement must be completed by the date indicated on the academic calendar which is located in the academic calendar section of the catalog. If you are completing degree requirements during the summer term you must complete the form for the preceding May graduation. A student is allowed to walk only once in a commencement ceremony. Students must be actively enrolled in the semester that they graduate and meet the requirements of the degree. This form is online at the following URL: interact.sdsmt.edu/aes/graduation.htm

Minimum Graduation Standards

To be awarded a baccalaureate degree, an associate degree or a certificate a student must at a minimum have a cumulative GPA of 2.0 or higher.

Associate Degree

The institution granting the degree determines the honors designation for its associate-level graduates. To earn an honor designation at graduation, an associate-level graduate must meet both the following cumulative and institutional grade point averages:

With highest honor:

equal to or greater than 3.90

With high honor:

equal to or greater than 3.70 and less than 3.90

With honor:

equal to or greater than 3.50 and less than 3.7

An associate-level graduate must have completed a minimum of 15 credit hours at the institution granting the degree. In addition, 8 of the last 15 credit hours earned preceding completion of the degree must be earned from the institution granting the degree. Courses that are part of a formal collaborative agreement among Regental universities are considered to be earned from the institution granting the degree.

Baccalaureate Degree

The institution granting the degree determines the honors designation for its graduates. To earn an honors designation at graduation, the student must meet both the following cumulative and institutional grade point averages:

Summa Cum Laude:

equal to or greater than 3.90

Magna Cum Laude:

equal to or greater than 3.70 and less than 3.90

Cum Laude:

equal to or greater than 3.50 and less than 3.70

The student must have completed a minimum of 30 credit hours at the institution granting the degree. In addition, 15 of the last 30 credit hours earned preceding completion of the degree must be earned from the institution granting the degree. Courses that are part of a formal collaborative agreement among Regental universities are considered to be earned from the institution granting the degree.

Two Bachelor of Science Degrees From South Dakota School of Mines and Technology

An undergraduate student who wishes to qualify for a second bachelor of science degree must complete all requirements for both degrees granted.

To qualify for a second bachelor of science degree conferred by School of Mines, a student must complete all additional unique required courses for the second degree above the minimum 130 credits required for an engineering degree or the minimum 120 credits required for a science degree.

Additionally, 30 semester credits must be completed above and beyond the 130 credits (required for an engineering degree) or the 120 credits (required for a science degree). This means 130 credits plus 30 credits for two engineering degrees or 120 credits plus 30 credits for two science degrees. The residency requirement of a minimum of 30 credit hours completed at the institution granting the degree applies to both degree programs.

If pursuing two (2) bachelor of science degrees simultaneously, a student must report this intent to the Office of the Registrar and Academic Services. This action will initiate the assignment of an advisor in each discipline. If returning to school to pursue a second bachelor of science degree, a student should investigate possible financial aid implications by contacting David Martin or Erin Richards in the Financial Aid Office.

Qualifying for a second bachelor of science degree should not be confused with qualifying for a double major. See section on "Double Major in Science Programs."

General Requirements

The following rules on graduation requirements apply for the bachelor of science degree in any curriculum offered by the university. Requirements that apply to many or all programs are described below. Please refer to the curriculum for an individual degree program for specific course requirements. Each candidate for a degree is personally responsible for meeting all requirements for graduation. No university official can relieve a candidate of this responsibility.

The South Dakota School of Mines and Technology reserves the right to change any course of study or any part of a curriculum in keeping with accreditation, educational, and scientific developments.

Bachelor of Science General Education Requirements

General education core requirements must be completed within the ninety (90) credits. Requests for exceptions to these general education requirements must be approved by the student's advisor and by the Vice President for Academic Affairs/Provost. The required core is listed below as well as the courses currently offered through SD Mines. See BOR policy 2:7 for more information on General Education Requirements. For a complete list of courses that will fulfill the requirements, see the General Education Requirements Checklist.

Goal #1 and #2

Goal #1: Students will write effectively and responsibly and understand and interpret the written expression of others.
Goal #2: Students will communicate effectively and responsibly through speaking and listening.

Credit Hours: 6 hours (Goal #1)/3 hours (Goal #2)

Courses:

- ENGL 101 Composition I **Credits: (3-0) 3**
- ENGL 279 Technical Communications I **Credits: (3-0) 3**¹
- ENGL 289 Technical Communications II **Credits: (3-0) 3**¹

Curriculum Notes

¹ Technical Communications I and II develop written and speech communications in an integrated fashion in the context of the major. Students must finish the entire sequence, as well as ENGL 101, to satisfy the requirements of Goal #1 and Goal #2.

Goal #3

Students will understand the organization, potential, and diversity of the human community through study of the social sciences.

Credit Hours: 6 hours in two disciplines

Courses:

- ANTH 210 Cultural Anthropology **Credits: (3-0) 3**
- GEOG 101 Introduction to Geography **Credits: (3-0) 3**
- GEOG 210 World Regional Geography **Credits: (3-0) 3**
- GEOG 212 Geography of North America **Credits: (3-0) 3**
- HIST 151 United States History I **Credits: (3-0) 3**
- HIST 152 United States History II **Credits: (3-0) 3**
- POLS 100 American Government **Credits: (3-0) 3**
- POLS 250 Introduction to International Relations **Credits: (3-0) 3**
- PSYC 101 General Psychology **Credits: (3-0) 3**
- SOC 100 Introduction to Sociology **Credits: (3-0) 3**
- SOC 150 Social Problems **Credits: (3-0) 3**
- SOC 250 Courtship and Marriage **Credits: (3-0) 3**

Goal #4

Students will understand the diversity and complexity of the human experience through study of the arts and humanities.

Credit Hours: 6 hours in two disciplines or in a sequence of foreign language courses)

Courses:

- ART 111/111A Drawing I **Credits: (3-0) 3**
- ART 112/112A Drawing II **Credits: (3-0) 3**
- ARTH 211 History of World Art I **Credits: (3-0) 3**
- ENGL 210 Introduction to Literature **Credits: (3-0) 3**
- ENGL 212 World Literature II **Credits: (3-0) 3**
- ENGL 221 British Literature I **Credits: (3-0) 3**
- ENGL 222 British Literature II **Credits: (3-0) 3**
- ENGL 241 American Literature I **Credits: (3-0) 3**
- ENGL 242 American Literature II **Credits: (3-0) 3**
- ENGL 250 Science Fiction **Credits: (3-0) 3**
- GER 101 Introductory German I **Credits: (4-0) 4**
- GER 102 Introductory German II **Credits: (4-0) 4**
- HIST 121 Western Civilization I **Credits: (3-0) 3**
- HIST 122 Western Civilization II **Credits: (3-0) 3**
- HUM 100 Introduction to Humanities **Credits: (3-0) 3**
- HUM 200 Connections: Humanities & Technology **Credits: (3-0) 3**
- MUS 100 Music Appreciation **Credits: (3-0) 3**
- MUS 117 Music in Performance I **Credits: (1-0) 1**¹

- PHIL 100 Introduction to Philosophy **Credits: (3-0) 3**
- PHIL 200 Introduction to Logic **Credits: (3-0) 3**
- PHIL 220 Introduction to Ethics **Credits: (3-0) 3**
- PHIL 233 Philosophy and Literature **Credits: (3-0) 3**
- SPAN 101 Introductory Spanish I **Credits: (4-0) 4**
- SPAN 102 Introductory Spanish II **Credits: (4-0) 4**

Curriculum Notes

¹ Repeatable for up to 3 credits towards partial satisfaction of Goal 4 Humanities requirement.

Goal #5

Students will understand and apply fundamental mathematical processes and reasoning.

Credit Hours: 3 hours

Courses:

- MATH 102 College Algebra **Credits: (3-0) 3**
- MATH 115 Precalculus **Credits: (5-0) 5**
- MATH 120 Trigonometry **Credits: (3-0) 3**
- MATH 123 Calculus I **Credits: (4-0) 4**
- MATH 125 Calculus II **Credits: (4-0) 4**
- MATH 225 Calculus III **Credits: (4-0) 4**
- MATH 281 Introduction to Statistics **Credits: (3-0) 3**

Goal #6

Students will understand the fundamental principles of the natural sciences and apply scientific methods of inquiry to investigate the natural world.

Credit Hours: 6 hours

Courses:

- BIOL 151 General Biology I **Credits: (3-0) 3**
- BIOL 151L General Biology I Lab **Credits: (0-1) 1**
- BIOL 153 General Biology II **Credits: (3-0) 3**
- BIOL 153L General Biology II Lab **Credits: (0-1) 1**
- CHEM 106 Chemistry Survey **Credits: (3-0) 3**
- CHEM 106L Chemistry Survey Lab **Credits: (0-1) 1**
- CHEM 112 General Chemistry I **Credits: (3-0) 3**
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1**
- CHEM 114 General Chemistry II **Credits: (3-0) 3**
- CHEM 114L General Chemistry II Lab **Credits: (0-1) 1**
- GEOL 201 Physical Geology **Credits: (3-0) 3**
- GEOL 201L Physical Geology Laboratory **Credits: (0-1) 1**
- PHYS 111 Introduction to Physics I **Credits: (3-0) 3**
- PHYS 111L Introduction to Physics I Laboratory **Credits: (0-1) 1**
- PHYS 113 Introduction to Physics II **Credits: (3-0) 3**
- PHYS 113L Introduction to Physics II Laboratory **Credits: (0-1) 1**
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3**
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**
- PHYS 213L University Physics II Laboratory **Credits: (0-1) 1**

For information regarding the Associate of Arts degree requirements, see [General Studies, AA](#).

Semester Credit and Grade-Point Average

Additional requirements are listed with each departmental curriculum found in a later section of this catalog. All curricula require passing grades in the prescribed courses and a minimum cumulative grade point average of 2.00. Each engineering curriculum requires 130 hours of credit for graduation and each science curriculum requires one 120 hours of credit.

Military Science Credits

Military Science credits may apply to all degrees as free electives. This option varies with the number of free electives available in an individual curriculum. A veteran may petition the Office of the Registrar to receive credit for basic military science and physical education.

Transfer Credit

Articulation of credit may be allowed for previous college education if the courses are equivalent to required or elective courses at this university and if each course presented is of passing quality.

The acceptability of transfer credit is determined by the student's major department.

Transfer credit for work at a junior, community college (two year) and/or two-year technical college may not exceed one-half of the hours required for completion of the baccalaureate degree at the accepting institution.

Credit Definitions

Credits in Residence

Credit in residence within the Board of Regents system is a course offered by any of the degree-granting Regental institutions at any approved sites using any approved method of delivery.

Institutional Credits

An institutional credit is a credit offered by the degree granting institution and includes credits that are part of a formal collaborative agreement between that institution and another Regental institution.

Validated Credits

Credit earned for college level courses by validation methods such as Credit by Exam, CLEP, AP, portfolio, and others within the Regental system will not be considered "credits in residence."

Institutional Credit Requirements for Degree-Seeking Students

1. Minimum number of credit hours that must be earned from the institution granting the degree:

Baccalaureate	30 hours
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Associate	15 hours
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2. Number of the last credit hours earned preceding completion of the degree that must be earned from the institution granting the degree:

Baccalaureate	15 of the last 30 hours
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Associate	8 of the last 15 hours
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3. Minimum number of credit hours specified in the major or minor requirements that must be completed at the degree granting institution: 50 percent. However, this requirement may be waived for students enrolled in the set of majors offered by the system's Centers which include in the established programs of study common courses offered by one of the other Regental universities. In addition, the Vice President for Academic Affairs/Provost may make exceptions to this requirement for individuals based on the student's prior learning experiences.

Required Check-out Procedure

All graduating seniors and students terminating enrollment at School of Mines are responsible for ensuring that they have returned all keys, library books, laboratory equipment, and other university property to the appropriate departments prior to graduation or their last day of enrollment. All financial obligations to the university or any of its departments must also be paid prior to graduation or termination of enrollment at School of Mines.

Perkins Student Loan recipients must complete an exit interview with a Business Office representative prior to graduation or termination of enrollment at School of Mines. The university reserves the right to withhold a student's diploma and/or transcript of grades for failure to meet any of the above specified requirements.

Graduate Education Policies

Graduate Student General Information

South Dakota School of Mines and Technology (SD Mines) offers graduate degree programs at the master's and doctoral levels. The graduate programs provide opportunities for advanced study and research in the fields of engineering and science. Each individual degree program of study is designed to broaden and extend the student's knowledge within the chosen field, to develop the power of independent critical thinking, and to promote individual and cooperative research skills.

The first master's degree program was authorized at the South Dakota School of Mines and Technology in October 1935, and the first degree was granted in 1937. Permission to offer the first Ph.D. program was granted in January 1967 to the Department of Geology and Geological Engineering. Seven additional Ph.D. programs have been authorized since that time with the most recent addition being a Ph.D. in Civil and Environmental Engineering in 2014. The Office of Graduate Education was created in the 1950-51 academic year.

The policies of the Office of Graduate Education are formulated by the Council of Graduate Education, which is advisory to the dean of graduate education. The policies are approved by the SDSM&T administration, the SDSM&T Faculty Senate, and the South Dakota Board of Regents when applicable and are administered by the dean of graduate education. This catalog provides the rules which apply to graduate students.

In the following descriptions the term "program" refers to a department, a division in a department such as the Construction Engineering and Management program within the Department of Civil and Environmental Engineering, or a non-departmental unit such as Biomedical Engineering, Materials Engineering and Science, or Nanoscience and Nanoengineering. Forms mentioned in the catalog are available at the Office of Graduate Education and on the Office of Graduate Education website.

Nature and Purpose of the Graduate Programs

The non-thesis and professional master's programs are designed to build a student's depth and breadth of knowledge and to enhance the student's preparation for a career in industry. Development of technical and managerial knowledge through course work is the primary focus of these degree programs. Programs typically include a combination of required and elective courses outlined in an individualized program of study supervised by a program coordinator. Some degrees may also encourage or require the completion of an independent project.

The MS thesis and PhD graduate programs are designed to prepare a student for a lifetime of intellectual inquiry that manifests itself in creative scholarship and research, often leading to professional careers in academia, government, business, and industrial organizations. These programs emphasize freedom of inquiry and expression and development of the student's capacity to make significant contributions to knowledge. An essential element is the development of the ability to understand and evaluate critically the literature of the field and to apply appropriate principles and procedures to the recognition, evaluation, interpretation, and understanding of issues and problems at the frontiers of knowledge. These goals are most effectively accomplished in close association with those experienced in research and teaching.

A central purpose of doctoral programs and Master of Science thesis programs is the extension of knowledge, but this cannot be accomplished on all fronts simultaneously. Students must choose an area in which to specialize, a faculty member with whom to work, and a research topic of mutual interest to the student and the faculty advisor. Individualized programs of study are then developed and committee members are selected cooperatively as coursework and research are undertaken. When all coursework has been completed, the research finished, the thesis or dissertation written, and all examinations passed, the student will have acquired the knowledge and skills expected of a scholar and will have expanded the knowledge and research capability in the field.

The Council of Graduate Education

Graduate education and graduate research are among the most important functions of South Dakota School of Mines and Technology. They constitute an important element of the vitality of scholarly inquiry and intellectual achievement in the university. An important responsibility for all matters pertaining to graduate education and graduate research rests with the faculty. To provide for an important mechanism for the faculty to create, foster and maintain graduate education and graduate research programs of high quality and accomplishment, the Council of Graduate Education (CGE) is formed to:

1. Advise the dean of graduate education on all matters pertaining to graduate education
2. Establish and revise policies of graduate education
3. Review and approve/disapprove proposed graduate programs, courses and revisions
4. Review and approve/disapprove student applications of fellowships and scholarships sponsored by the Office of Graduate Education.

Graduate level curricula developments proposed by departments will be submitted to the Council of Graduate Education for review and appropriate endorsement for consideration by the Faculty Senate. Policies of graduate education will be approved by the CGE and submitted to the Faculty Senate for its approval.

The chairperson of the Council of Graduate Education is the dean of graduate education. The chair reports the results of the CGE recommendations on graduate education curricula, courses, and programs to the Curriculum Committee, and subsequent consideration by the Faculty Senate, Provost and Vice President for Academic Affairs. The chair reports CGE policy recommendations directly to the Faculty Senate for its consideration and approval, and subsequent consideration by the provost and vice president for academic affairs.

The membership of the Council of Graduate Education shall consist of voting representatives from each department with a graduate program. Members are to be elected by each academic department. Departments with one, 2, or more graduate programs will have one representative. Graduate programs that do not yet have a home department may also have a voting representative. Departments that do not have graduate programs may appoint non-voting representatives.

Graduate Programs

Master of Science degrees are offered in:

Atmospheric and Environmental Sciences
Biomedical Engineering
Chemical Engineering
Civil Engineering
Computational Sciences and Robotics
Construction Engineering and Management
Electrical Engineering
Engineering Management
Geology and Geological Engineering
Materials Engineering and Science
Mechanical Engineering
Mining Engineering and Management
Paleontology
Physics

Master of Engineering degrees are offered, with emphasis areas in Civil and Environmental Engineering, Electrical Engineering, and Materials Engineering and Science.

Doctor of Philosophy degrees are offered in:

Atmospheric and Environmental Sciences
Biomedical Engineering
Civil and Environmental Engineering
Chemical and Biological Engineering
Geology and Geological Engineering
Materials Engineering and Science
Mechanical Engineering
Nanoscience and Nanoengineering
Physics

I. Admission Policies

I.1. General Requirements for Graduate Admissions

I.2. International Student Admissions

I.2.a. English Proficiency

I.2.b. International Transcript Evaluation Requirements

I.2.c. Visa Requirements

I.2.d. Medical Insurance

1. General Requirements for Graduate Admissions

The Office of Graduate Education encourages applications from qualified students holding bachelor's degrees in engineering or science from accredited 4-year colleges and universities. A student desiring admission should obtain an application form from the Office of Graduate Education or via the website. The completed form and a non-refundable application fee of \$35 are required to be submitted to the Office of Graduate Education for all applicants. Required supporting documents are specified on the application and on the website. Additional information about requirements for specific graduate programs can be found in the program description section of the catalog.

All applicants wishing to be considered for admission or funding should submit their completed application package no later than February 15 for the Fall semester, August 15 for the Spring semester, and January 15 for the Summer semester. Note that some departments may have additional or different deadlines that may apply; please refer to the departmental websites for more information. Applications submitted after the above guidelines may be considered by some departments; please contact individual departments for more information. Applicant files will not be considered for acceptance until all of the required application materials are received. Applications completed by the above deadlines will, in most cases, receive a decision within one month of the deadline. If the applicant has not completed an undergraduate program, evidence of graduation must be submitted prior to enrollment.

When an application for admission to a graduate program is received, the faculty of the program in which the applicant expects to major will evaluate the applicant's academic qualifications. The department head or program coordinator, on behalf of the faculty, will recommend whether or not the applicant should be accepted into the graduate program and whether the admission should be as an unconditional, conditional, probationary, or non-degree seeking (special) student. The dean of graduate education will review this recommendation and provide a letter of decision to the applicant.

Admission for study toward a master's degree does not imply that the student will be accepted to a doctoral program. A separate application and evaluation of the student's qualifications are necessary before acceptance into a doctoral program. Admission to a program for study toward a PhD degree does not constitute admission to candidacy for the PhD degree. Refer to GEP VIII.3., The Comprehensive Examination and Admission to PhD Candidacy, for more information.

A student who is admitted to an academic program but is unable to attend in the semester in which he/she was accepted may request a deferment for up to 2 years. The request must be made in writing to the Office of Graduate Education and must specify the revised start date. Deferments must be approved by the dean of graduate education. Students must reapply if the anticipated start date is more than 2 years after the original semester of acceptance.

Students who are denied admission are not eligible to reapply to the same program for one year.

2. International Student Admissions

a. English Proficiency

All international applicants must provide evidence of English proficiency, with the exception of applicants from countries where English is the native language. Applicants who have a prior degree from a college or university in the U.S. may also be exempted, based on English courses taken and grades received in those courses.

SD Mines has established minimum scores for admission for TOEFL, IELTS and the Pearson Test of English-Academic, listed below. We recognize a variety of valid English proficiency tests listed below which will be evaluated on an individual basis. English proficiency test results must be sent to the Office of Graduate Education. Please use school code 6652 for TOEFL results to be sent to SD Mines

Detailed information regarding the English proficiency requirement is available on our website at <http://www.sdsmt.edu/Admissions/International-Students/English-Proficiency/>.

Test	Minimum Score*	Upper Level Score **
TOEFL - iBT (internet based test)	68	83
TOEFL - CBT (computer based test)	190	220
TOEFL - PBT (paper based test)	520	560
IELTS	5.5	6.5
Pearson Test of English - Academic (PTE)	47	56

*Minimum scores require English proficiency testing upon arrival at the university.

**Upper level scores indicate that no additional proficiency testing is required by the university. However, additional testing and instruction may be required based on a student's performance on other placement exams, in the classroom, or by the academic department.

Applicants who are planning to attend an intensive English as a Second Language (ESL) program in the U.S. prior to attending SD Mines may be eligible for conditional admission. Conditional admission may be granted if the applicant meets admission requirements with the exception of the minimum English score as indicated above. SD Mines also recognizes the difficulty for ESL students in taking standardized exams that are offered only in English, such as the Graduate Record Examination (GRE). Students in ESL programs may be required to take such tests after they have advanced to a certain level in ESL. Requirements will be specified in a conditional admission letter sent to the student. Once the student has completed the ESL program with satisfactory grades and meets any additional requirements, the student may be eligible for unconditional admission.

b. International Transcript Evaluation Requirements

SD Mines requires a third party foreign transcript evaluation for all incoming international graduate students and U.S. students who have attended an institution outside the U.S. Exceptions can be granted by the dean of graduate education for exemplary students who are recommended for a waiver by the academic program to which the student is applying. The two primary evaluation companies in the U.S. are World Education Services (WES) and Educational Credential Evaluators (ECE). SD Mines requires a course-by-course evaluation report to be sent by the evaluating institution directly to the Office of Graduate Education.

c. Visa Requirements

For the most recent requirements, please visit the Ivanhoe International Center website: <http://international.sdsmt.edu>.

An international applicant will not be issued the U.S. Department of Justice form I-20, Certificate of Eligibility for Non-immigrant (F-1) student status, until admission to SD Mines for study toward a specific advanced degree has been granted. Form I-20 is usually necessary for admission to the U.S. for college attendance. Conditions of issuance of this form include documented evidence of financial ability to cover the projected annual costs of education at this university including living allowance. This institution will issue a DS-2019 form only when appropriate.

International students are advised that full-time status at this university is necessary in order to satisfy F-1 status requirements.

As a result of the regulations that became effective on January 1, 2003, the Family Educational Rights and Privacy Act (FERPA) is waived for F and J students with respect to reporting requirements specific to student status. The regulations will be strictly enforced by the appropriate bureau(s) within the US Department of Homeland Security (DHS), and information will be reported electronically to DHS via Student and Exchange Visitor Information System (SEVIS). The consequences to students for non-compliance with the new regulations are severe. For more information, e-mail the Ivanhoe International Center at Ivanhoe@sdsmt.edu or go to <http://international.sdsmt.edu>.

d. Medical Insurance

Each international student (and any dependents accompanying him/her to the United States) is required to enroll in a major medical hospitalization/surgical insurance plan. Contact the Ivanhoe International Center for details. The only exception to this rule is if the student is sponsored by his/her home country government (documentation of this policy is required). Life insurance is also strongly recommended.

II. Funding Policies

II.1. Graduate Assistantships

II.2. Assistantships with Tuition and/or Fee Support

II.3. Graduate Fellowships and Other Resources

1. Graduate Assistantships

SD Mines has funds available from various sources for graduate assistantships (GAs) and fellowships. Such awards are usually made on the basis of scholastic merit and the availability of funds. Assistantships are not available to students on probation unless an exception is granted by the dean of graduate education. Graduate special students (non-degree-seeking students) are not eligible to receive assistantships.

Graduate teaching assistantships (GTAs), graduate research assistantships (GRAs), and hybrid GRA/GTA positions are offered. A GTA assists with instruction within laboratory sections, grades papers, or performs other assigned instructional duties. A GRA is compensated to conduct supervised research, generally relating to the student's thesis or dissertation research. Hybrid positions have a combination of the duties of GRAs and GTAs, as determined by the funding department.

The dean of graduate education grants the GA award, acting upon the recommendation of the department head, program coordinator, or major professor, after evaluation of the student's academic record, overall qualifications, and programmatic progress.

GAs under state contract are subject to institutional policies set forth in the faculty/staff handbook. GRAs are required to sign an employee agreement to disclose inventions form. GTAs are required to sign a family educational rights and privacy act compliance form.

A student with a graduate assistantship should recognize that the prescribed hours of research work are minimum expectations mandated by employment practices and may not represent the effort that will be actually necessary to produce satisfactory progress and completion of a thesis or dissertation within a reasonable period of time.

Students must register for credits before assistantships and fellowships are processed for the semester for which they are authorized. Graduate assistants who are eligible for reduced tuition at one South Dakota regental institution are also eligible for reduced tuition at other South Dakota regental institutions.

Graduate assistantships may include partial or full tuition and fees support as a benefit, as defined by South Dakota Board of Regents policy.

2. Assistantships with Tuition and Support

The minimum compensation, established annually by the South Dakota Board of Regents and currently set at \$3,907, must be awarded in each semester to qualify for reduced tuition.

Additionally, a student with an assistantship must meet the following minimum registration requirements to qualify for reduced tuition:

1. Spring and Fall Assistantships: The minimum registration required to receive reduced tuition with a qualifying assistantship in a fall or spring semester is 9 credits. Note, also, that FICA withholding applies to all graduate students with assistantships, or paid on an hourly basis, who are enrolled in fewer than 5 credits in either the Fall or Spring semester.
2. Summer Assistantships: The minimum registration required to receive reduced tuition with a qualifying assistantship in the summer is 2 credits. Note, however, that FICA withholding applies to all graduate students with assistantships, or paid on an hourly basis, who are enrolled in fewer than 3 credits in the summer semester.

Certain specialized courses that are outside the graduate curricula of SD Mines are not eligible for reduced tuition (<http://www.sdsmt.edu/Admissions/Tuition-and-Fees/Tuition-Rates-Descriptions/>). These include English remediation classes. Internet self-support courses (course sections labeled 840T) are eligible for reduced tuition.

A student receiving an assistantship along with tuition remission is required to maintain 9 credits throughout the semester in which the support is received. If a student drops to fewer than 9 credits, the student will immediately lose the assistantship and will be required to repay the institution for the tuition remission on the dropped class unless the student adds additional credits to maintain full time status. Students who withdraw from the institution or have their assistantship terminated in the middle of the semester will have their assistantship stipend and tuition remission reduced as described in SD Mines Policy II-6-D.

3. Graduate Fellowships and other Resources

A number of fellowships from industrial and governmental agency sources are currently available. Eligibility requirements and restrictions are parallel to those for graduate assistantships except that a minimum registration of only 2 credits during the fellowship semester(s) is required. A fellowship award usually does not include reduced tuition and fees as a benefit. Pre-registration by continuing students is required to prevent payment delays.

Graduate students who are U.S. citizens or eligible non-citizens may be eligible for other forms of financial aid such as federal Stafford student loans, federal Perkins student loans, or federal work study. Application and requests for additional information on these programs should be made to the Financial Aid Office at SD Mines.

III. Registration Policies

- III.1. Graduate Student Registration
- III.2. Definition of Full Time & Half Time Registration
- III.3. Continuing Registration Requirements
- III.4. Minimum Academic Load
- III.5. Maximum Academic Load
- III.6. Leave of Absence

1. Graduate Student Registration

A graduate student will report to the advisor specified in the acceptance letter and thereafter will follow the registration procedure for all SD Mines students. The advisor is responsible for counseling the graduate student with respect to programmatic requirements until the student has selected a major professor. In some programs, the advisor may continue to work with the student and the major professor to ensure that all degree requirements have been satisfied.

2. Definition of Full Time and Half Time Registration

A full time graduate student is defined as a student registered for 9 or more credit hours per semester at any of the universities in the South Dakota regental system during the academic year. All international students must be registered full-time to maintain student status with the U.S. government.

A three quarter time graduate student is defined as a student registered for at least 7 credits but fewer than 9 credit hours per semester during the academic year.

A half time graduate student is defined as a student registered for at least 4.5 credits and fewer than 7 credit hours per semester during the academic year.

2 credits are considered full-time during the summer for Office of Graduate Education purposes, including awarding assistantships and fellowships.

Audited credits do not apply toward the above definitions. Remedial English classes and deficiency courses count toward the determination of full-time status.

3. Continuing Registration Requirements

Degree-seeking graduate students must be registered on a continuing basis during each fall and spring semester. The number of credits required is specified in the next section, GEP III. 4. Minimum Academic Load. This requirement applies regardless of whether the graduate student is in residence, is off-campus, or is pursuing a degree on a part time basis. Failure to maintain continuing registration will result in deactivation of the graduate student's program. Graduate students who fail to comply and subsequently wish to return to their same program of study will be required to obtain written permission from the department head or program coordinator and the dean of graduate education and may be required to reapply. Students may petition for a leave of absence if they are unable to fulfill the continuing registration requirement (See section GEP III.6. Leave of Absence). Graduate non-degree seeking (special) students are exempt from the continuing registration rule.

4. Minimum Academic Load

Degree seeking graduate students must enroll for a minimum of 2 credits during the spring and fall semesters. A student must also register for a minimum of 2 credits during the summer if the student is using departmental or institutional resources or is graduating in the summer semester. Minimum registration is required during any semester in which a student schedules or takes exams, conducts research, defends a thesis/dissertation, or completes a degree. The number of credit hours taken in excess of the minimum should accurately reflect the extent of the graduate student's coursework and research activities.

Graduate students must meet this minimum registration requirement during the specific semester or summer in which they complete all requirements for their degree and become eligible for graduation. If a student fails to complete all requirements for graduation at the end of a semester there will be no grace period. Hence students who fail to complete all degree requirements prior to the official closure date for a given semester or summer will be required to register for a minimum of 2 credits during a subsequent semester or summer in order to graduate.

Please refer to section GEP II.2. Assistantships with Tuition and Support for additional information on the number of credit hours required during a semester to be eligible for assistantships and financial aid.

5. Maximum Academic Load

Thirteen (13) credit hours per semester are considered to be the maximum graduate load. Higher loads must be approved by the dean of graduate education and the major professor. Students wishing to take a higher course load must complete a course overload request form. Appropriate course loads should be determined in conjunction with the advisor or major professor and should reflect the effort required for students working as GTAs or GRAs.

6. Leave of Absence

A student who is unable to continue his/her program of graduate study due to unanticipated circumstances may request a leave of absence from his/her program of study by completing and submitting a request for leave of absence form, available in the Office of Graduate Education and at the graduate education website. The form must be completed and signed by the student, the student's major professor, and the department head or program coordinator; then it is submitted to the Office of Graduate Education. The dean of graduate education will evaluate the request and either approve or deny it. If the request is approved, the student will not be subject to continuing registration, and the leave of absence will not count toward the time limits to complete his/her program of study. A leave of absence is determined on a semester basis and is usually limited to a maximum of one calendar year. International students are not eligible for a leave of absence if they intend to remain in the U.S. during the leave of absence.

IV. Enrollment Policies

- IV.1. Dual Enrollment in PhD & MS Programs
- IV.2. Accelerated Master's Programs
- IV.3. Change of Program
- IV.4. Adding a PhD Program
- IV.5. Non-degree Seeking Graduate Students [Special Graduate Students]
- IV.6. Probation and Reinstatement Policy
- IV.7. Appeal Procedure

1. Dual Enrollment in PhD & MS Programs

Concurrent enrollment in a PhD program and an MS program in the same department/program is encouraged, if allowed by the department/program. Concurrent enrollment in a PhD program and an MS program in a different department/program is normally not allowed.

Exception Policy:

A student who seeks an exception to the above policy must follow the procedure set forth below. Students must be aware that exceptions to this policy will be granted only under extraordinary circumstances.

1. The PhD student must obtain prior written approval for this dual-degree plan from his/her major professor and the head/coordinator of the relevant PhD program.
2. If approval is granted in Step 1, then the PhD student must obtain written approval for the MS degree plan from the head/coordinator of the corresponding MS program.
3. If approval is granted for Step 2, then the student will need to establish a second graduate student advisory committee (thesis option only) and file a separate program of study (required for all thesis and non-thesis students) for the MS degree with the Office of Graduate Education.
4. The dean of graduate education will have authority to either approve or disapprove this second program of study.
5. The first 2 semesters of the dual program will be considered probationary. The second program of study can be terminated based on recommendations of the PhD committee and/or MS committee to the dean of graduate education.
6. A student who is granted dual enrollment in 2 departments/programs according to the procedure listed above may petition to use all graduate credits earned at SD Mines toward both the MS and PhD degrees, within the constraints of the program and other graduate education policy, and subject to approval by the graduate committees for each program and the department head/program coordinator.

A student who is not dually enrolled, but who has fulfilled the requirements of an SD Mines non-thesis MS degree en route to a PhD, may petition to receive the MS degree by submitting a valid program of study for the MS. This petition must be made before the student is admitted to PhD candidacy.

2. Accelerated Master's Programs

Accelerated MS degree programs enable students to complete both the BS and MS degrees in as little as 5 years. These accelerated degrees are selective programs to which a student must apply. The details for a particular program can be found in the program information section of the catalog. The Accelerated option is currently available for most programs, but not all programs may choose to offer an accelerated option.

Students desiring to participate in an accelerated program are encouraged to apply at the end of their junior year, but they must submit a complete application before the start date of the last semester in which they are enrolled in the BS degree. A minimum undergraduate cumulative GPA of 3.0 is required at the time the student applies to the program.

Programs may impose additional GPA requirements; see program information for further details. Programs may grant exceptions to the minimum GPA requirement under situations approved by the dean of graduate education.

Up to 12 credits applied toward the BS program may be used to satisfy graduate credit requirements. See individual programs for the number of credits allowed by the program and other program-specific restrictions. Students applying to an accelerated MS program must fill out an accelerated MS advising plan and find an interim advisor or major professor prior to admission to the MS program. Students are not formally admitted to the graduate school until they have completed their undergraduate degree. Note that it is South Dakota Board of Regents policy that undergraduate students are not permitted to take 700 level and 800 level classes. The accelerated MS advising plan can be revised at any time, with the concurrence of the interim advisor or major professor and the department/program head or coordinator. The following restrictions apply:

1. The courses must be taken at the 400/500/600 level as an undergraduate. Courses taken at the 400 level are subject to the other requirements listed in this catalog in section GEP VI.4. Credit Policies for All Graduate Degrees.
2. Only courses taken at SD Mines are eligible for dual credit.
3. No transferred courses from other institutions will be allowed to count toward the accelerated master's degree.

Additional rules concerning application of other credits toward a MS degree, that are not used for the student's undergraduate degree, are listed in section GEP VI.4. Credit Policies for All Graduate Degrees.

3. Change of Program

A student who wishes to change programs should request the change using an intent to transfer form. The current program must be notified prior to seeking the transfer. Approval from the proposed new program is required. If admittance to the new program is not granted, the possibility of a discontinuation from study in any area at SD Mines is possible. Upon favorable recommendation from the new program, the dean of graduate education will issue a letter of transfer and notify the appropriate offices and the student of the change.

4. Adding a PhD Program

If a student completes the MS degree and wishes to continue for a PhD the student must apply to the doctoral program. If a student is enrolled in an MS program and wishes to enter the doctoral program without completing the MS degree, the student must apply for a transfer of programs.

If a student is enrolled in a master's program, the student's department/program shall determine by qualifying examination or by review of his/her record to date whether the student shall be permitted to transfer to the doctoral degree. Upon approval of the transfer, the department head or program coordinator, after consultation with the student and the existing advisory committee, shall expand the student's committee to a total of 5 members who will assist with the student's doctoral program.

5. Non-degree Seeking Graduate Students [Special Graduate Students]

An individual who holds a baccalaureate degree and wishes to pursue further study without a commitment to an advanced degree may apply to the Office of Graduate Education for admission as a special student at the graduate level. The applicant must provide evidence of the baccalaureate degree. Upon admission as a special student, he/she will be subject to Office of Graduate Education policies. A maximum of 12 credit hours may be accumulated, after which a special student must either apply for admission as a degree seeking student or must petition for a variance from this policy. A course with a grade of incomplete counts toward the 12 credit maximum. Graduate students classified as special students are not eligible for assistantships. If a student is granted admission to a program as a degree-seeking student, a maximum of 12 credits taken as a special student may be applied toward the degree.

6. Probation and Reinstatement Policy

An applicant who has a large number of deficiencies, or whose undergraduate record is below admissions standards, may be admitted to the graduate program on probationary status. For a student admitted on probation, a deficiency in grade requirements during the first semester of enrollment may be considered sufficient grounds for terminating the student's enrollment in the graduate program. Such a termination decision will be made by the dean of graduate education after consulting with the student's major professor and the department head or program coordinator.

A current graduate student who does not meet the following requirements (items 1-7 below) during any semester will be placed on probation and will be informed by the dean of graduate education. A failure to remove the deficiencies during the following semester may be considered sufficient grounds for terminating the student's enrollment in the graduate program. Assistantships are not available to students on probation unless an exception is granted by the dean of graduate education.

Probation imposed because of grade deficiencies in specific courses (items 2 and 3 below) will continue each semester until the course has been retaken and an acceptable grade has been received. Probation imposed because of overall GPA deficiencies (item 1 below) will continue each semester until the GPA reaches the acceptable level.

A student will be placed on probation for a U grade received for research credit(s). Because a U is a final grade, probation will be maintained until at least one subsequent S credit is awarded. A student may graduate with "U" grades, but must also accumulate S grades for the required minimum number of research credits in a given advanced degree program. A student who has transferred from a thesis to a non-thesis program and who has received U grades as the last research grades in the thesis program will be admitted to the new program on a probationary status. Such probation may be removed by satisfactory progress (according to the usual performance criteria) during the first semester in the new program.

In addition to probation triggered by academic performance, a student may be placed on probation for failing to meet programmatic or institutional requirements. Probation for such deficiencies will be removed after the requirement has been satisfied. A student's probationary status will be reviewed at the close of each semester for appropriate action: removal from probation, continuation of probation, or termination. A student may petition the dean of graduate education for reconsideration of a termination decision. (Refer to section GEP IV.7. Appeal Procedure.)

1. A student must maintain a B (3.00) or better grade point average in all 300 through 800 level courses that appear on the graduate transcript at SD Mines. Thesis and dissertation research credit hours and grades will not be counted in the determination of this GPA.
2. A student must earn no less than a C (2.00) grade in any graduate course (500 through 800 level), which is to be credited toward advanced degree requirements by appearing on the program of study form.
3. A student must earn no less than a B (3.00) in any 300 or 400 level course taken for graduate credit, and which is to be credited toward advanced degree requirements by appearing on the program of study form.

4. A student's thesis or dissertation research must be of a quality to warrant the issuance of a final grade of S or an interim grade of NP. A research grade of U will result in the student being placed on probation.
5. A student must earn no less than a B (3.00) in any deficiency course required by the graduate student advisory committee even though the course cannot be applied toward a graduate degree.
6. A student must pass all courses taken on the pass-fail basis. (Refer to section GEP V.3. Pass/Fail Option for Graduate Students.)
7. A student must remove all other program deficiencies, such as meeting stated deadlines for applicable qualifying, comprehensive, and final examinations; selection of a graduate student advisory committee; and filing of a satisfactory program of study in the Office of Graduate Education.

7. Appeal Procedure

Procedures for appealing or petitioning for a variance from certain policies, when such variances are permitted in unusual or exceptional circumstances, are set forth in the relevant sections of this document. Appeals or petitions involving such matters as grade changes from F or I to W must be lodged with the Academic Appeals Committee through the vice president for academic affairs, after review by the dean of graduate education.

Appeals concerning probation, suspension, or potential variances in academic graduate policy should first be lodged with the student's major department/program. Before rendering a decision on the appeal, the department head or program coordinator will seek a recommendation from the student's graduate student advisory committee. If the student is not satisfied with the decision on the appeal, the student may petition the dean of graduate education for reconsideration of the appeal. The Council of Graduate Education may be called upon to render a decision in such cases.

The South Dakota Board of Regents policy Student Appeals for Academic Affairs, 2:9, addresses student dissatisfaction with assigned grades. The process begins with the student meeting with the professor who issued the grade. For any further appeal, contact the head of the academic department.

For situations not covered above, or if the student is dissatisfied with a prior appeal decision, he/she should seek the advice of the dean of graduate education or the dean of students to determine what recourse is available to assist in seeking a solution.

V. Grading Policies

- V.1. Graduate Grading System
- V.2. Course Retake Policy
- V.3. Pass-Fail Option for Graduate Students
- V.4. Grade Appeal Procedure
- V.5. Calculation of Graduate GPA

1. Graduate Grading System:

The grades listed in this section can be assigned to all courses with course numbers of 500 or greater. Plus and minus grades are not used.

a. Coursework Final Grades

A Exceptional

4.00 grade points per semester hour.

B Good

3.00 grade points per semester hour.

C Average

2.00 grade points per semester hour.

D Unsatisfactory

1.00 grade point per semester hour.

F Failure

0.00 grade points per semester hour.

S Satisfactory

Does not calculate into any GPA. This is the grade that will appear on a transcript for a successfully completed course taken with the pass/fail option or for research credits (see below).

U Unsatisfactory

Does not calculate into any GPA.

This is the grade that will appear on a transcript for failing to complete a pass/fail course or research credits (see below).

W Withdrawal

Does not calculate into any GPA, no credit granted.

AU Audit

Does not calculate into any GPA. An audit (AU) grade may be granted only when the student has elected the AU option on, or prior to, the census date of the term.

b. Incomplete Grades

I Incomplete

Does not calculate into any GPA. An incomplete (I) grade may be granted only when all of the following conditions apply:

- a. A student has encountered extenuating circumstances that do not permit him/her to complete the course.
- b. The student must be earning a passing grade at the time the Incomplete is requested. Anticipated course failure is not a justification for an incomplete.
- c. The student does not have to repeat the course to meet the requirements.
- d. The instructor must agree to grant an incomplete grade as evidenced by the Incomplete Grade Contract.
- e. The instructor and student must agree on a plan to complete the coursework.
- f. The coursework must be completed within one calendar year of the last date of the semester of the course in question. Extensions may be granted by the dean of graduate education.
- g. If the student completes the course within the specified time, the grades that may be assigned are A, B, C, D, F, S, or U.
- h. If the student does not complete the course within the specified time the incomplete grade remains on the transcript.

IP In Progress

Does not calculate into any GPA. An in progress (IP) grade may be granted only when all of the following conditions apply:

- a. The requirements for the course (for every student enrolled in the course) extend beyond the current term.
- b. The extension beyond the current term must be defined before the class begins.
- c. The instructor must request permission to award IP grades for a course from his or her department head or program coordinator and from the dean of graduate education. Then approval must be obtained from the vice president for academic affairs.
- d. A definite date for completion of the course must be established in the course syllabus.

c. Research Grades

S Satisfactory

Does not calculate into any GPA. This is a final grade for a research course (including thesis or dissertation research).

U Unsatisfactory

Does not calculate into any GPA. This is a final grade for a research course (thesis or dissertation research).

NP Normal Progress

Does not calculate into any GPA. A normal progress (NP) grade calculates into attempted credits but does not calculate into completed credits. Research grades do count toward attempted credits once a final grade of S or U is assigned. A normal progress (NP) grade may be granted by an instructor when the instructor determines that a graduate student is making normal progress in a graduate Thesis/Dissertation course. This is intended to be an intermediate grade which should be changed to 'S' or 'U' upon completion of the course requirements.

d. Additional Grading Options

NR Grade not reported by the Instructor

Does not calculate into any GPA.

EX Credit by Exam

Does not calculate into any GPA. An examination for credit (EX) grade may be granted only for non-course credit validation obtained through a validation process. This grade is not used for any Regental university course.

CR Credit

Does not calculate into any GPA. A credit (CR) grade may be granted only for non-course credit that is not related to an examination or to equating transfer grades to the Regental grading system. This grade is not used for any Regental university course.

TR Transcribed

Does not calculate into any GPA and no credit is granted.

LR Lab grade linked to Recitation Grade

0 credit course.

2. Course Retake Policy

A student will be allowed a total of 2 registrations for any particular graduate course (course numbers of 500 and above) for which credit is to be counted toward graduation. The student must petition the dean of graduate education and obtain the dean's approval to be permitted to take a graduate course more than 2 times. If a course is repeated for a passing or improved grade, only the grade for the last attempt will be included in the computation of the cumulative grade-point average shown on the graduate student's transcript.

A student will be allowed multiple registrations for certain graduate courses for which credit toward graduation may be received more than once (e.g., Independent Study, Thesis, Research, etc.). Grades for such courses, where applicable, will be used for grade point average calculations. Please note that individual departments/programs may limit the number of credits allowed toward graduation in these types of courses.

3. Pass/Fail Option for Graduate Students

The following policy pertains to the pass/fail option at the graduate level:

1. 100 and 200 level courses, either within or outside of the department, which cannot be applied for credit toward a graduate degree may (with the consent of the student's major professor and graduate student advisory committee) be taken on a pass/fail basis under the same rules that apply to undergraduate students.
2. 300 through 800 level courses outside of the student's department/program may (with the consent of the student's major professor and graduate student advisory committee) be taken on a pass/fail basis except that a C grade shall be considered the lowest passing grade. The maximum number of hours of pass/fail work for which a MS degree student may receive credit will be 6 for the thesis option and 9 for the non-thesis option.
3. No 300 through 800 level courses offered by the student's major department/program may be taken for credit under the pass/fail option. Beyond the master's level, the pass/fail option may be exercised at the discretion of the graduate student advisory committee but must still be approved by the dean of graduate education.

4. Grade Appeal Procedure

Refer to section GEP IV.7 Appeal Procedure for information regarding appeals for course or research grades.

5. Calculation of Graduate GPA

The graduate cumulative grade point average (GPA) is calculated from all courses that appear on the graduate transcript, with the exception of the specific courses or grades listed in section GEP V.1. Graduate Grading System. Note that thesis (798) and dissertation (898) credits are not included in the GPA. Project credits (788 or 888) that have been assigned a grade of U or S are not included in the GPA, but project credits with a letter grade WILL be included in the GPA.

VI. General Degree Requirements

VI.1. Supervision of Advanced Degree Programs

VI.1.a. Composition of Graduate Committees

VI.1.b. Changes in Committee Membership

VI.1.c. Emergency Committee Substitutions

VI.2. Program of Study

VI.3. Certification of Degree Requirements

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VI.4.a. Graduate Course Level Requirements

VI.4.b. Advanced Degree Grade Requirements

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VI.4.d. Dual Credit for Multiple Programs

VI.4.e. Graduate credits earned at SD Mines

VI.4.f. Applying Credits from Outside Institutions

VI.4.g. Applying Undergraduate Level Credits Toward an Advanced Degree

VI.4.h. Applying Graduate Level Credits Taken as an Undergraduate Toward an Advanced Degree

VI.4.i. Application of Credits Taken as an Undergraduate Student or Special Graduate Student Toward an

Advanced Degree

VI.5. Thesis/Dissertation Submission Requirements

VI.6. Thesis/Dissertation Defense Requirements

VI.7. Time Limitation for Graduate Degrees

VI.8. Participation in Commencement

VI.8.a. Applying to Graduate

VI.8.b. PhD Student Deadline for Participation

VI.8.c. Master's Student Deadline for Participation

1. Supervision of Advanced Degree Programs

a. Composition of Graduate Committees

The supervision of the general study program of each student, including compliance with all the various South Dakota Board of Regents, institutional, and Office of Graduate Education policies, is primarily the responsibility of the advisor. For all thesis and dissertation degrees, the graduate student advisory committee assists in this role. The graduate student advisory committee consists of a minimum of:

- a major professor,
- a graduate representative, (must not be from the student's department/program),
- one additional member for master's students, for a minimum total of 3 members, or
- 3 additional members for doctoral students, for a minimum total of 5 members.

For the purposes of these roles (below), faculty may be in the professorial track (tenure-track or non tenure-track), instructor or lecturer track, or research scientist track.

The major professor is primarily responsible for supervision of the graduate student's research and thesis/dissertation preparation, as well as ensuring that academic standards and requirements are met and satisfied. The advisor and the major professor may or may not be the same person, depending on restrictions or requirements within the student's program and/or department.

The major professor serves as chairperson of the graduate student advisory committee and assists the student in selection of other members of the committee. To be eligible to serve as a major professor on a graduate student advisory committee, the person must be a full time faculty member at SD Mines. In the case of emeritus faculty or retired faculty, departments may petition the dean of graduate education for an exception to this policy. For supervision of a master's program, the major professor must have a minimum of an MS degree. For supervision of a doctoral program, the major professor must have a minimum of a doctoral degree.

A co-major professor is not required, but may be beneficial to the student's committee. To be eligible to serve as a co-major professor, the person must be approved by the student's department or program. For supervision of a master's program, the co-major professor must have a minimum of an MS degree. For supervision of a doctoral program, the co-major professor must have a minimum of a doctoral degree.

The Graduate Representative is a faculty member of a graduate student advisory committee (must not be from the student's department/program) that represents the Office of Graduate Education and is a voting member on a doctoral or master's committee whose responsibilities are to:

- represent the broad concerns of the Office of Graduate Education and the University with respect to high standards of graduate education and scholarly performance,
- assure that all procedures are carried out fairly and according to the guidelines of the Office of Graduate Education,
- participate in conducting final examinations and provide an outcome report to the Office of Graduate Education immediately following the final exam,
- assist in the resolution of committee disputes.

To be eligible to serve as the graduate representative on a graduate student advisory committee, the person must be a full-time faculty member at SD Mines. The person must be from a department other than the student's home department, and must be approved by the student's major program and the dean of graduate education. For supervision of a master's program, the graduate representative must have a minimum of an MS degree. For supervision of a doctoral program, the graduate representative must have a minimum of a doctoral degree.

To be eligible to serve as a committee member at large on a graduate student advisory committee, the person must hold a minimum of a BS degree, and must be approved by the student's major program. Students must have a minimum of one committee member with a doctoral degree. Departments may petition the dean of Graduate Education for exceptions.

Off-campus persons, including emeritus faculty, retired faculty, and members of industry, may serve as a co-major professor or committee member at large if they meet the requirements listed above. Such persons should contact Human Resources to file a volunteer agreement prior to serving on the committee. The committee must consist of a minimum of 3 members from the SD Mines campus. If a committee contains more than 5 members, a majority of the committee must be members from the SD Mines campus. In the case of emeritus faculty or retired faculty, departments may petition the dean of graduate education for an exception to this policy.

A person with graduate student status cannot serve on a graduate student advisory committee. Under extraordinary circumstances departments may petition the Council of Graduate Education for an exception to this policy.

b. Changes in Committee Membership

A change in major professor may be accomplished at the student's request by submitting a request with the change of advisor form, with all appropriate approval signatures, to the dean of graduate education. Such a change of major professor also requires a new program of study. Changes of committee members other than the major professor require:

- approval by the major professor via email,
- approval by the new committee member via email,
- documented approval of the current program of study by the new committee member.

A change of the graduate representative requires:

- approval by the major professor via email,
- approval by the new committee member via email,
- documented approval of the current program of study by the new committee member,
- approval by the dean of graduate education.

c. Emergency Committee Substitutions

When a committee member or graduate division representative is unable, due to last-minute unforeseen circumstances, to attend a scheduled defense, an alternate may be designated so that the defense may proceed. The absentee will immediately notify the major professor and the dean of graduate education with a description of the circumstances warranting the absence and the name of a willing alternative who meets the requirements for committee membership. The major professor will make the determination as to whether the defense should go forward or be rescheduled. The alternate will attend the defense and sign the defense results report on behalf of the absentee committee member. The absentee will still provide written feedback on the thesis/dissertation to the student in a timely manner and will sign the title page to indicate final acceptance of the document. No more than one alternate committee member is permitted at a defense.

2. Program of Study

For all thesis and dissertation degrees, the graduate student advisory committee will assist the student in formulating a schedule of coursework leading to the advanced degree. A copy of the appropriate form and graduate student advisory committee signatures must be filed by the student and submitted to the student's department/program and the Office of Graduate Education.

For all non-thesis programs, the program coordinator or an assigned academic advisor will normally assist the student in formulating a schedule of coursework leading to the advanced degree. A program of study signed by the advisor (in addition to the signature of the program coordinator or department head) must be filed by the student and submitted to the student's department/program and the Office of Graduate Education.

All graduate students are required to submit a POS no later than the mid-term of the semester after which 9 credit hours have been completed or for which a grade of Incomplete has been issued. This is usually the second semester of study for full time degree seeking students. These forms can be found at the graduate education website. The program of study is used for degree audits to ensure that students have fulfilled all degree requirements.

Students applying to an accelerated MS program must fill out an accelerated MS advising plan, as detailed in section GEP IV.2. Accelerated Master's Programs. Accelerated MS students must submit a program of study in the first semester following the completion of the BS degree.

Students in pursuit of a thesis or dissertation degree who have been granted a leave of absence before submission of a program of study will be required to submit a program of study by midterm of the semester after completion of 9 credit hours.

Revised programs of study must be filed in a timely manner by the student and with the same offices as the original schedule. Minor course substitutions can be made with the approval of the major professor via email, along with a brief explanation of the changes. Consult the instructions provided with the POS form regarding additional procedures for revising the POS.

3. Certification of Degree Requirements

Before a diploma can be released, the dean of graduate education must certify that the student has fulfilled all degree requirements. For certification of the degree for a given semester, ALL requirements must be complete on or before the scheduled due dates published by the Office of Graduate Education. Note that all keys must be returned to the facilities office before the degree is granted.

Graduate students must meet the minimum registration requirement (currently 2 credits) during the specific semester or summer in which they complete all requirements for their degree and become eligible for graduation. There will be no grace period; hence, students who fail to complete all degree requirements prior to the official closure date for a given semester or summer will be required to register for a minimum of 2 credits during a subsequent semester or summer in order to graduate.

Students are strongly cautioned not to make travel plans or other arrangements that will be difficult or costly to change until they are certain that all degree requirements can and will be satisfied. It is the responsibility of the student to know and comply with these degree requirements.

4. Credit Policies for All Graduate Degrees

a. Graduate Course Level Requirements

1. The student cannot apply any credit hours or grades for 100 and 200 level courses (which are usually taken to overcome academic deficiencies) toward advanced degree requirements. If, in the opinion of the student's major professor and graduate student advisory committee, progress in these courses is unsatisfactory, additional work may be required to demonstrate proficiency.
2. Of credits counted for an advanced degree, at least 50 percent of the credit hours in any graduate program must be at the 600 level or above. Exceptions must be approved by the dean of graduate education.

b. Advanced Degree Grade Requirements

To qualify for any advanced degree, the faculty has stipulated that the following requirements must be satisfied:

1. The student must earn a minimum 3.00 cumulative GPA as calculated from all courses that appear on the graduate transcript. See section GEP V.5. Calculation of Graduate GPA for additional information.
2. The student must earn a C grade or better in any graduate course (500 through 800 level), which is indicated to be credited toward advanced degree requirements by appearing on the program of study form.
3. The student must earn a B grade or better in any 300 or 400 level course which is indicated to be credited toward advanced degree requirements by appearing on the program of study form.
4. The student's thesis or dissertation research must be of a quality to earn a final grade of S.
5. A student who fails any course within their discipline as defined by their department/program must repeat the course with a passing grade as defined above. The student may petition through his or her advisor or major professor to the dean of graduate education for an exception to this rule.

c. Research Credits

Research credit may be applied toward the fulfillment of credit-hour requirements used toward the advanced degree. Research credits are defined as either doctoral dissertation credits (898), doctoral non-dissertation research credits (888), master's thesis credits (798), or master's non-thesis research credits (788). All other credits are course credits. Elective credits are "course credits". Research credits are not normally calculated into the cumulative graduate GPA; see section GEP V.5. Calculation of Graduate GPA for more information.

d. Dual Credit for Multiple Programs

Up to 12 credit hours that have been used, or are being used, to satisfy requirements for one MS degree at SD Mines may be applied toward another MS degree from this institution, with the separate approval of the relevant advisors, programs and departments for each degree. In no cases can double-counted credits (either double-counted MS/MS, or BS/MS) be triple counted toward a third degree (BS, MS, MEng or PhD).

e. Graduate credits earned at SD Mines

All graduate credits earned at SD Mines are eligible for use in MS and PhD degrees granted by SD Mines, within the constraints of the program and other graduate education policy, and subject to approval by the graduate committees for each program and the department head/program coordinator. However, undergraduate credits used for an accelerated MS degree may not be used a third time toward a second graduate degree.

f. Applying Credits From Outside Institutions

A minimum of 60% of the credit hours in the graduate degree program must be completed from the institution granting the degree.

Transfer credits. Credits for graduate level coursework taken at another institution are eligible to be transferred and applied to the requirements for a degree at SD Mines. A maximum of 12 coursework credits may be transferred to a MS degree and a maximum of 24 coursework credits may be transferred to a PhD degree. Students wishing to request transfer credits must use the appropriate transfer of credits form found on the graduate education website.

Reduction of credits. PhD candidates already holding an MS degree awarded by an institution other than SD Mines may request a maximum of 24 semester credits of appropriate MS coursework credits and a maximum of 6 credits of acceptable MS research credits to apply to the PhD credit requirement. Students wishing to make such a request must use the reduction of credits form found on the graduate education website.

All requests for transfer credits or reduction of credits are subject to approval by the student's graduate committee. The final list of courses that may be applied to the MS or the PhD is established at the time that the student's program of study is approved.

Domestic graduate transfer courses and transfer grades are recorded and evaluated by SD Mines, calculated into grade point averages according to the South Dakota regental grade scheme, and recorded on the student's academic transcript only if these transfer courses are equivalent to a specific graduate course at SD Mines, or a course approved by the program coordinator or department head. International transfer courses will appear on the transcript along with the number of credits earned, but no grade will appear or be calculated into grade point average. See GEP VIII. PhD Degree Requirements for additional details.

Such credit from institutions external to the South Dakota regental system must be reviewed and approved by the student's committee and by the dean of graduate education. The dean of graduate education shall notify the registrar and director of academic services in writing of the credits to be accepted and placed on the student's transcript. An

official transcript received directly from the issuing institution to support the request is required. The transferred course number, title, and semester hours will be entered on the student's transcript.

g. Applying Undergraduate Level Credits Toward an Advanced Degree

Undergraduate-level credits (300 or 400 level) taken as a graduate student are automatically placed on an undergraduate transcript and may not be used toward a graduate degree except under the following circumstances:

1. The courses must be approved by the student's graduate student advisory committee and by the department head or program coordinator.
2. The student must have earned a B grade or better in any 300 or 400 level course which is to be credited toward advanced degree requirements. (See also individual department restrictions on 300-400 level courses.)
3. The student cannot apply any credit hours or grades for 100 and 200 level courses (which are usually taken to overcome academic deficiencies) toward advanced degree requirements. If, in the opinion of the student's advisor, major professor and graduate student advisory committee, progress in these courses is unsatisfactory, additional work may be required to demonstrate proficiency.
4. The number of undergraduate credits not used to fulfill requirements for the undergraduate degree that may be applied toward a master's degree is limited to 9 hours.
5. A candidate who has entered a PhD program directly from a baccalaureate program may be allowed to use up to 12 credits of upper-division undergraduate 400-level courses (which have not been applied toward the baccalaureate) toward the 36 credit-hour course requirement for the degree, with the same restrictions and procedures as those specified for master's degrees. PhD candidates already holding an MS degree may use up to 6 credits of 400-level coursework in addition to any courses credited from the MS degree. The head of the student's major department must petition the Council of Graduate Education through the dean of graduate education for use of 300-level credits for PhD programs.

h. Applying Graduate Level Credits Taken as an Undergraduate Toward an Advanced Degree

1. Graduate level credits taken as an undergraduate and used to fulfill requirements for the undergraduate degree may not be used toward a graduate degree unless the credits were taken as part of an approved accelerated master's program at SD Mines.
2. Up to 12 semester hours of graduate level credits taken as an undergraduate and not used to fulfill requirements for the undergraduate degree may be used toward a graduate degree only after the courses in question are approved by the graduate student advisory committee.

i. Applying Credits Taken as an Undergraduate Student or Special Graduate Student Toward an Advanced Degree

The maximum total number of SD Mines credits, taken as an undergraduate student or special graduate student, which were not applied to an SD Mines degree and that can be used toward a graduate degree, is 12. Note that these credits are in addition to any "doubly counted" credits associated with Accelerated Master's programs.

5. Thesis/Dissertation Submission Requirements

A master's thesis should represent an effort of such quality and construction that it can be displayed in the school library with similar scholarly works, as well as providing material for publication(s) in an appropriate professional journal(s).

A Ph. D. dissertation is expected to advance or modify knowledge and demonstrate the candidate's technical mastery of the field of study.

The thesis/dissertation is written under the direction of the major professor, but the student should seek guidance from all members of the graduate student advisory committee. Before starting to write the thesis or dissertation, the student is urged to review the document titled "Thesis and Dissertation Writing Manual" on the graduate education website and to consult style manuals online or in the SD Mines Devereaux Library. In general, the document may follow the style of captions, footnotes, and bibliographical references used by the leading technical journal in the student's field.

In lieu of the conventional thesis/dissertation format, the document can consist of a compilation of published and/or submitted journal manuscripts that are derived from the student's research and are either authored or co-authored by the student. Theses or dissertations submitted in this form must have an introduction and conclusion to tie the journal papers into a cohesive research paper. The final document must be accompanied by an abstract of 250 to 300 words and vitae of the student. Detailed instructions on the format, requirements and completion of a thesis or dissertation can be found on the website of the Office of Graduate Education.

A final draft of the thesis/dissertation, which must include all components, including title page, abstract, vita, references, etc., should be submitted by the student to each member of the graduate student advisory committee a minimum of 2 full weeks before the time and date of the student's scheduled defense. Final drafts must be complete, including all required components or the defense cannot be held. Earlier submission deadlines may be required by the graduate student advisory committee.

The graduate student's committee-approved draft must be submitted to the Office of Graduate Education by the published deadline (approximately 2 weeks before commencement) to allow adequate time for grammatical review, corrections and revisions. This draft, after all revisions recommended by the committee have been made, must be signed by the author and approved, signed, and dated by all committee members, the department head/program coordinator of the student's major department/program, and the dean of graduate education before any copies are made for final reproduction.

The institution requires one electronic copy and 2 paper copies (the original unbound manuscript and one bound copy) of the thesis/dissertation to be kept in the Devereaux Library. Additional copies may be required by the student's program or department.

The dissemination of a thesis or dissertation may be temporarily restricted due to legal or proprietary issues (ITAR, EAR, FAC, proprietary, or otherwise restricted information). A restricted thesis/dissertation requires approval by the dean of graduate education and the graduate student advisory committee prior to the defense. Attendance at the defense will also be restricted. The hard copies and digital version(s) of the restricted document will not be released until the end of the specified period, which may not exceed 3 calendar years.

6. Thesis/Dissertation Defense Requirements

A student pursuing a Master's thesis option must defend the thesis in an oral examination. The final Master's coursework examination and thesis research defense may be combined (see the GEP VII.5. Final Examination section for more information).

A PhD candidate must defend the dissertation in an oral examination.

The thesis/dissertation defense is open to the public except in the case of a restricted document (see the GEP VI.5. Thesis/Dissertation Submission Requirements section above). The defense will be scheduled at any time after the student has completed the required coursework and after the graduate student advisory committee is satisfied that the draft is an acceptable manuscript in terms of technical quality, completeness, and proper expression and usage in American Standard English. A defense may not be scheduled during the period of university final examinations. Under no circumstances should a defense go forward if the draft manuscript is incomplete.

The student shall obtain and complete the appropriate form to schedule the defense and, in conjunction with the major professor, shall seek the approval of all committee members. The student shall submit the signed form with the Office of Graduate Education no less than 5 working days before the defense. The Office of Graduate Education will announce the defense to the campus community.

The student's committee constitutes the examining board for the defense. The major professor will head the session. The major professor is responsible for ensuring that a majority of the committee is present. The graduate representative must be physically present for the defense to go forward. The defense will not be held if these conditions cannot be met. A negative vote by any 2 or more members of the student's committee will signify failure of the defense, pending review by the graduate student advisory committee and the dean of graduate education.

Results of the defense/examination will be attested to by all committee members on a form furnished to the graduate representative by the Office of Graduate Education. Results must be returned to the Office of Graduation immediately following the exam by the graduate representative or other committee member to ensure chain of custody. If the student fails to satisfy the examiners on either coursework or thesis/dissertation, written or oral examinations, the committee may schedule a re-examination over general background, thesis/dissertation, or both. The re-examination will be scheduled at the discretion of the graduate student advisory committee, normally 8 to 12 weeks after the date of the first examination. The student may petition his or her committee for re-examination prior to the 8 week limit.

7. Time Limitation for Graduate Degrees

A master's degree program must be completed within 5 calendar years dating from the student's formal entrance into a degree seeking program.

A doctoral degree program must be completed within 8 calendar years dating from the student's formal entrance into a degree-seeking program.

In exceptional circumstances, students may petition the dean of graduate education for an extension to the time limit. Courses taken by the student at any institution that may be credited to the degree program and that were taken more than 5 years (for Master's) or 8 years (for PhD) prior to the date of anticipated graduation must be reviewed by the student's major department/program and the dean of graduate education for possible acceptance. Following this review, the student's major department/program and the dean of graduate education will determine whether a reduction in credits applicable toward the degree, a re-examination, or both, is required for the student to complete his or her degree program. The applicable forms are available at the graduate education website.

A student who is granted a leave of absence (see section GEP III.6. Leave of Absence) will not be subject to continuing registration, and the leave of absence will not count toward the time limits to complete his or her program of study.

8. Participation in Commencement

a. Applying to Graduate

A student must apply to graduate by completing the application for graduation form on the graduate education website and must meet the program requirements before the degree is awarded. The application for graduation form also serves as a request to participate in the commencement ceremonies. In general, for each degree earned, a student is allowed and encouraged to participate in commencement once and have his or her name in the commencement program once. Note that participation in the commencement ceremony does not equate to the conferring of a degree. The degree is conferred when all requirements are met and the release of diploma process is completed.

The names of all students who have completed the requirements for graduation by the designated spring semester deadline will be included in the spring commencement program, and students who have completed the requirements by the designated fall semester deadline will be included in the fall commencement program. Master's students who will complete their degree requirements in the summer term will be listed in the fall commencement program and are eligible to participate in the fall commencement ceremony. The student's name will appear in the program in the semester of completion whether the student is participating in the ceremony or not.

A student who wishes to participate in a commencement ceremony later than the semester in which the degree is completed must notify the Office of Graduate Education of his or her intent prior to the end of the semester in which the degree requirements are met. In general, a student is allowed to participate in a commencement ceremony within one year of completing the requirements for the degree.

b. PhD Student Deadline for Participation

A PhD candidate must have successfully defended his or her dissertation, have deposited his or her final thesis or dissertation, and have completed all other degree requirements, including all fees related to the printing, binding and distribution of their dissertation by the designated date to participate in commencement and the hooding ceremony.

c. Master's Student Deadline for Participation

Master's students who have substantially completed the degree requirements but will not meet the related spring or fall semester deadlines may petition the dean of graduate education to participate in commencement. Summer graduates who meet the requirements listed below may petition the dean of graduate education to participate in the spring commencement. The appropriate form is available on the website. An approved petition does not grant a waiver of registration requirements; students with an approved petition will be required to register during the semester of graduation (see section GEP III.4. Minimum Academic Load).

Requests for Master's students to participate in commencement prior to degree completion are typically only granted if:

1. For the thesis option, the student has completed all of the research for the thesis topic, and has substantially completed the writing of major portions of the thesis,
2. For the non-thesis option, the student has completed all research associated with their project, if any, and has substantially completed the writing for that project (if any).
3. For the Spring commencement, the student has an agreed upon tentative defense date that is approved by the student's major professor and committee and that is at least three weeks prior to the end of the summer semester..
4. For the Fall commencement, the student has an agreed upon tentative defense date that is approved by the student's major professor and the committee and that is within approximately 30 days of the commencement ceremony.
5. The student has completed all of the courses necessary for the degree.

VII. Master's Degree Requirements

- VII.1. Master's Program Requirements
- VII.2. Thesis Option Requirements
 - VII.2.a. Thesis Submission Requirements
 - VII.2.b. Thesis Defense Requirements
- VII.3. Non-thesis Option Requirements
- VII.4. Accelerated MS Option Requirements
- VII.5. Final Examination

1. Master's Program Requirements

Master of Science programs at SD Mines may offer 2 options by which a student may complete the requirements for a degree: the thesis option and the non-thesis option. See individual program descriptions for details.

The Master of Engineering program at SD Mines is a course-based, non-thesis professional master's degree program combining technical and management coursework. See the program description for details.

Master's candidates already holding graduate credits from another institution may apply to transfer them to SD Mines under terms of section GEP VI.4.e. Applying Credits from Outside Institutions. Note that additional information regarding limitations on coursework that may be applied toward the degree can be found in section GEP VI.4. Credit Policies for All Graduate Degrees.

2. Thesis Option Requirements

The Master's degree minimum requirements for the thesis option are:

1. a program of at least 30 combined credit hours of coursework and research,
2. at least 15 credit hours of graduate coursework approved by the program (500 level courses and above),
3. at least 6 credit hours of thesis research and no more than 12 credit hours of thesis research, (However, the student may register for additional research credits for continuing registration purposes.)
4. a thesis that conforms to standard American English style and usage,
5. successfully defending the thesis,
6. meeting or exceeding academic standards prescribed elsewhere in this catalog, including maintaining at least a 3.0 cumulative GPA, and
7. satisfaction of all departmental- or program-specific requirements.

a. Thesis Submission Requirements

The thesis should represent an effort of such quality and construction that it can be displayed in the school library with similar scholarly works, as well as providing material for publication(s) in an appropriate professional journal(s).

Refer to section GEP VI.5. Thesis/Dissertation Submission Requirements for information on the submission of master's theses.

b. Thesis Defense Requirements

A student pursuing the thesis option must defend the thesis in an oral examination. The final coursework examination and thesis research defense may be combined (see the GEP VII.5. Final Examination section below).

Refer to section GEP VI.6. Thesis/Dissertation Defense Requirements for information regarding the scheduling and conduct of the thesis defense.

3. Non-thesis Option Requirements

Students enrolled in a non-thesis program may have the option of completing a non-thesis research project or taking additional course credits in place of the research project credits. The latter option is often referred to as a coursework only option and is common in professional degree programs. Students electing a non-thesis program should check with their program or department to determine which non-thesis options are available to them.

The minimum requirements for the non-thesis Master's degree option are:

1. a program of at least 30 credit hours of coursework (refer to specific program requirements for exact number of minimum coursework credit hours),
2. at least 20 credit hours of graduate level coursework approved by the program (500 and above),
3. a maximum of 6 credits of non-thesis research project,
4. meeting or exceeding academic standards prescribed elsewhere in this catalog, including maintaining at least a 3.0 cumulative GPA. and
5. satisfaction of all departmental- or program-specific requirements.

4. Accelerated MS Option Requirements

The accelerated master's program enables a student to complete both the BS and MS degrees in as little as 5 years. Up to 12 credits applied toward the BS program may be used to satisfy graduate credit requirements. See individual programs for the number of credits allowed by the program. Additional restrictions apply; please see section GEP IV.2. Accelerated Master's Programs for further information.

5. Final Examination

A master's student may be required by his or her program to take a final examination covering course material as a requirement for the degree. The examination may be written, oral, or both. All graduate student committee members must be given the opportunity for input to, and evaluation of, a final examination.

A student pursuing the thesis option must also defend the thesis in an oral examination. The final examination and thesis defense may be combined. Oral examinations, including a thesis defense, are open to all interested faculty members, except in the case of a restricted thesis (see section GEP VI.5. Thesis/Dissertation Submission Requirements). Departmental or program policy shall determine whether non-faculty persons may attend an oral non-thesis or coursework examination.

Unless combined with a thesis defense, final master's examinations are not scheduled with the Graduate Office, but the results of any such examination must be reported to the Graduate Office within 5 working days of the exam using the form provided on the graduate education web site. For programs that combine the thesis defense and final master's examination, the defense results report shall also serve to indicate the results of the final examination. Policies governing the defense process are described in section GEP VI.6. Thesis/Dissertation Defense Requirements.

VIII. PhD Degree Requirements

VIII.1. PhD Program Requirements

VIII.2. The Qualifying Examination

VIII.3. The Comprehensive Examination and Admission to PhD Candidacy

VIII.4. Dissertation Submission Requirements

VIII.5. Dissertation Defense Requirements

VIII.6. Residence Requirements

1. PhD Program Requirements

The general requirements for the doctor of philosophy degree are:

1. satisfactory completion of a comprehensive examination and admission to candidacy,
2. a minimum total of 72 semester credits beyond the bachelor's degree, at least 36 of which should be coursework credit hours,
3. a minimum of 20 semester credit hours of appropriate research credits,
4. meeting or exceeding academic standards prescribed elsewhere in this catalog, including maintaining at least a 3.0 cumulative GPA,
5. at least 2 consecutive semesters of residence as a full-time student,
6. a dissertation that conforms to standard American English style and usage, and
7. satisfaction of all departmental- or program-specific requirements.

Between 3 and 4 academic years of full-time graduate study beyond the baccalaureate degree normally are required to earn a doctorate. PhD candidates already holding graduate credits from another institution may request to apply them to the credits required for the PhD, under terms of section GEP VI.4.e. Applying Credits from Outside Institutions.

The graduate student advisory committee approves the total number of research credits that the candidate may carry, consistent with departmental, continuing registration, and other requirements.

The graduate student advisory committee can recommend to the dean of graduate education a program requiring more credits than the minimum indicated above if it believes that this is in the best interests of the student.

2. The Qualifying Examination

Doctoral students admitted into all PhD disciplines must pass a qualifying examination, normally to be taken within the first two years of enrollment, as per the specific guidelines of the program. The "qualifying exam" is a course-work based exam to test and demonstrate the doctoral student's proficiency in the foundational material of his or her discipline. When the student's program of foundational coursework has been substantially completed, she or he will undertake the qualifying examination. Results of this Qualifying Exam must be filed with the Office of Graduate Education by the department or program within one week of completion of the exam.

A master's student who proposes to continue into a doctoral program should so advise his or her major professor in a timely manner. The examination for the master's may be used as the qualifying examination, at the discretion of the department/program.

3. The Comprehensive Examination and Admission to PhD Candidacy

The "comprehensive exam" is a wide-ranging exam to test and demonstrate the doctoral student's readiness to pursue doctoral research. It includes a defense of a written dissertation proposal, and may also include additional written or verbal exam components to demonstrate the student's proficiency in his or her field of study. It will be prepared by the graduate student advisory committee, with potential suggestions from any faculty member from whom the student has taken a graduate course.

The graduate student advisory committee schedules and arranges the written and oral examinations. Review of the examinations will be accomplished as soon as possible by all members of the committee. If the graduate student's advisory committee and department head/program coordinator certify that the candidate has passed the comprehensive examination, the signed admission to candidacy form must be submitted by the graduate representative or another committee member to the dean of graduate education for review and approval.

Satisfactory completion of the comprehensive examination requires that no more than one member of the graduate student advisory committee votes against passing. Upon satisfactory completion of the comprehensive exam, the student is then eligible for admission to candidacy. If the student passes with conditions, such as failure to pass a part of the examination, the committee shall inform the student promptly as to how and when the conditions may be removed. If the student has failed the comprehensive examination, another such examination should not be attempted during the same semester, though exceptions to this may be granted by the student's committee in consultation with the dean of graduate education. If the student fails a second time, work toward the doctorate can be continued only with the consent of the graduate student advisory committee, the Council of Graduate Education, and the dean of graduate education.

The comprehensive examination, and subsequent admission to candidacy, should be passed at least 12 months before the dissertation is defended. Results of the comprehensive exam and admission to candidacy must be filed with the Office of Graduate Education by the graduate representative within a week of completion of the exam.

4. Dissertation Submission Requirements

The dissertation is expected to advance or modify knowledge and demonstrate the candidate's technical mastery of the field of study. Refer to section GEP VI.5. Thesis/Dissertation Submission Requirements for information on the submission of the PhD dissertation.

5. Dissertation Defense Requirements

Refer to section GEP VI.6. Thesis/Dissertation Defense Requirements for information regarding the scheduling and conduct of the dissertation defense.

6. Residence Requirements

At least 2 consecutive semesters of residence as a full-time student are required at South Dakota School of Mines and Technology unless an exception is granted by the dean of graduate education and the Faculty Senate.

The student's graduate advisory committee may approve a plan for the student to undertake work at other institutions, but may not reduce the two semester residence requirement.

Academic Programs

Associate of Arts

General Studies, AA

Contact Information

Dr. Frank Van Nuys

Department of Social Sciences

Classroom Building 305

(605) 394-2489

E-mail: Frank.VanNuys@sdsmt.edu

The Associate of Arts Degree in General Studies is a two-year degree program that provides a student the opportunity to complete a curriculum in traditional fields of study. The total semester credits required is 60. The curriculum offers a broad and varied background in general education as well as opportunities to explore a number of disciplines as a basis for entrance into a four-year degree program. Completion of the A.A. degree will fulfill the general education requirements for an associate degree at the state universities of South Dakota. Approved general education courses from other state universities may be used to satisfy the School of Mines general education requirements. The program of studies is as follows:

Associate of Arts Degree General Education Requirements

The AA degree requires 24 semester credits of general education coursework. Students are responsible for checking with their advisors for any program modifications that may occur after the publication of this catalog.

A. Written Communication (Goal 1)

A minimum of 6 semester hours is required. Courses offered at Mines include the following:

- ENGL 101 Composition I **Credits: (3-0) 3**
- ENGL 201 Composition II **Credits: (3-0) 3**
- ENGL 279 Technical Communications I **Credits: (3-0) 3**

B. Oral Communication (Goal 2)

A minimum of 3 semester hours is required. Courses offered at Mines include the following:

- ENGL 279 Technical Communications I **Credits: (3-0) 3**
- ENGL 289 Technical Communications II **Credits: (3-0) 3**
- SPCM 101 Fundamentals of Speech **Credits: (3-0) 3**

Note(s):

Students who intend to continue at or return to Mines for a BS degree are recommended to take a sequence of ENGL 101, ENGL 279, ENGL 289 to complete their Goals 1 and 2.

C. Social Sciences (Goal 3)

Courses in anthropology, economics, geography, history, political science, psychology, and sociology may be used. A minimum of 3 semester hours is required. Courses offered at Mines include the following:

- ANTH 210 Cultural Anthropology **Credits: (3-0) 3**
- HIST 151 United States History I **Credits: (3-0) 3**
- HIST 152 United States History II **Credits: (3-0) 3**
- POLS 100 American Government **Credits: (3-0) 3**
- POLS 165 Political Ideologies **Credits: (3-0) 3**
- POLS 250 Introduction to International Relations **Credits: (3-0) 3**
- PSYC 101 General Psychology **Credits: (3-0) 3**
- SOC 100 Introduction to Sociology **Credits: (3-0) 3**
- SOC 150 Social Problems **Credits: (3-0) 3**
- SOC 250 Courtship and Marriage **Credits: (3-0) 3**

Note(s):

Students who intend to continue at or return to SD Mines for B.S. degree should take a minimum of 6 semester hours in two different disciplines, with two different prefixes.

D. Arts and Humanities (Goal 4)

Courses in western civilization, literature, philosophy, religion, non-English languages, art, music, and theatre may be used. A minimum of 3 semester hours is required. Courses offered at Mines include the following:

- ART 111/111A Drawing I **Credits: (3-0) 3**
- ART 112/112A Drawing II **Credits: (3-0) 3**
- ARTH 211 History of World Art I **Credits: (3-0) 3**
- ENGL 210 Introduction to Literature **Credits: (3-0) 3**
- ENGL 212 World Literature II **Credits: (3-0) 3**
- ENGL 221 British Literature I **Credits: (3-0) 3**
- ENGL 222 British Literature II **Credits: (3-0) 3**
- ENGL 241 American Literature I **Credits: (3-0) 3**
- ENGL 242 American Literature II **Credits: (3-0) 3**
- ENGL 250 Science Fiction **Credits: (3-0) 3**
- GER 101 Introductory German I **Credits: (4-0) 4 AND**
- GER 102 Introductory German II **Credits: (4-0) 4**

- HIST 121 Western Civilization I **Credits: (3-0) 3**
- HIST 122 Western Civilization II **Credits: (3-0) 3**
- HUM 100 Introduction to Humanities **Credits: (3-0) 3**
- HUM 200 Connections: Humanities & Technology **Credits: (3-0) 3**
- MUS 117 Music in Performance I **Credits: (1-0) 1**
- PHIL 100 Introduction to Philosophy **Credits: (3-0) 3**
- PHIL 200 Introduction to Logic **Credits: (3-0) 3**
- PHIL 220 Introduction to Ethics **Credits: (3-0) 3**
- PHIL 233 Philosophy and Literature **Credits: (3-0) 3**
- SPAN 101 Introductory Spanish I **Credits: (4-0) 4 AND**
- SPAN 102 Introductory Spanish II **Credits: (4-0) 4**

Note(s):

ART and ARTH are considered the same prefix.

Students must complete three semesters/three credits in MUS 117 to earn Humanities general education credit.

Students who intend to continue at or return to SD Mines for B.S. degree should take a minimum of 6 semester hours in two different disciplines, with two different prefixes.

E. Mathematics (Goal 5)

A minimum of 3 semester hours of college algebra or a math course with college algebra as a prerequisite is required.

- MATH 102 College Algebra **Credits: (3-0) 3**

F. Natural Sciences (Goal 6)

A minimum of 6 semester hours in the natural sciences is required plus one semester hour of laboratory (for an actual total of 7 credits in natural sciences). Courses in biology, chemistry, earth science, geology, and physics may be used. The following courses are offered at Mines:

- BIOL 151 General Biology I **Credits: (3-0) 3 AND**
- BIOL 151L General Biology I Lab **Credits: (0-1) 1**
- BIOL 153 General Biology II **Credits: (3-0) 3 AND**
- BIOL 153L General Biology II Lab **Credits: (0-1) 1**
- CHEM 112 General Chemistry I **Credits: (3-0) 3 AND**
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1**
- CHEM 114 General Chemistry II **Credits: (3-0) 3 AND**
- CHEM 114L General Chemistry II Lab **Credits: (0-1) 1**

- GEOL 201 Physical Geology **Credits: (3-0) 3 AND**
- GEOL 201L Physical Geology Laboratory **Credits: (0-1) 1**
- PHYS 111 Introduction to Physics I **Credits: (3-0) 3 AND**
- PHYS 111L Introduction to Physics I Laboratory **Credits: (0-1) 1**
- PHYS 113 Introduction to Physics II **Credits: (3-0) 3 AND**
- PHYS 113L Introduction to Physics II Laboratory **Credits: (0-1) 1**
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3**
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3 AND**
- PHYS 213L University Physics II Laboratory **Credits: (0-1) 1**

Electives

Total semester credits required to graduate with the AA degree is 60. The number of elective credits will vary depending on the courses selected in humanities, social sciences, mathematics, and natural sciences. All elective courses must be approved by the student's academic advisor.

Other Degree Requirements

Students must have achieved a minimum cumulative grade point average of 2.00 in order to graduate with this degree.

After completion of 45 credit hours, students may register for up to nine hours of 300 level courses.

Students must meet the Institutional Credit Requirements, which include completion of a minimum of 15 credits from School of Mines. In addition, 8 of the last 15 credits counted toward the degree must be taken from School of Mines.

Students must be enrolled in at least one course during the semester of graduation.

This information and an A.A. worksheet may be found at: <http://is.sdsmt.edu>.

Bachelor of Science

Applied Biological Sciences, BS

Contact Information

Lori D. Coble, Interim Department Head

Department of Chemistry and Applied Biological Sciences

Chemical and Biological Engineering/Chemistry 3317

Office Phone: 605-394-5132

E-mail: Lori.Coble@sdsmt.edu

The Department of Chemistry and Applied Biological Sciences (CABS) offers a BS degree as well as a minor in Applied Biological Sciences. The name "applied" added to the degree reflects modern-day biology that uses biological understanding to develop practical solutions to real world problems. The core curriculum includes a foundation in key applied biological areas including microbiology, genetics, cellular and molecular biology, and bioinformatics, as well as coursework in chemistry, math, and physics. The opportunity to "tailor" the degree by choosing elective courses, gives students a well-rounded education in preparation for a wide variety of career prospects and employment opportunities.

For detailed information about this major or department please view the Chemistry and Applied Biological Sciences department page.

Applied Biological Sciences Curriculum/Checklist

The following curriculum shows one embodiment of a path toward the ABS degree. The sequence of courses taken will depend on the academic preparation and career objectives of incoming students. Students should consult with an Applied Biological Sciences advisor for a more personalized course of study based on career goals within the applied biological sciences. It is important to note that certain courses have prerequisite requirements. Judicious selection of electives from the approved list will allow students specialized training in an applied biological sciences area, including microbiology, molecular biology, molecular genetics, pre-professional studies, or biomedical engineering.

Freshman Year

First Semester

- BIOL 111 Introduction to Chemistry and Applied Biological Sciences **Credits: (1-0) 1**
- BIOL 151 General Biology I **Credits: (3-0) 3** (Goal 6)*
- BIOL 151L General Biology I Lab **Credits: (0-1) 1** (Goal 6)*
- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6)*
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1**
- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1)*
- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5)*

Total: 16

Second Semester

- BIOL 153 General Biology II **Credits: (3-0) 3**
- BIOL 153L General Biology II Lab **Credits: (0-1) 1**
- CHEM 114 General Chemistry II **Credits: (3-0) 3**
- CHEM 114L General Chemistry II Lab **Credits: (0-1) 1**
- MATH 125 Calculus II **Credits: (4-0) 4**
- General Education Goal 3 or 4 Elective(s) **Credits: 3***

Total: 15

Sophomore Year

First Semester

- CHEM 326 Organic Chemistry I **Credits: (3-0) 3**
- CHEM 326L Organic Chemistry I Lab **Credits: (0-2) 2**
- BIOL 331 Microbiology **Credits: (3-0) 3**
- BIOL 331L Microbiology Lab **Credits: (0-1) 1**
- General Education Goal 3 or 4 Elective(s) **Credits: 3***
- PHYS 111 Introduction to Physics I **Credits: (3-0) 3**
- PHYS 111L Introduction to Physics I Laboratory **Credits: (0-1) 1**
- OR
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3**

Total: 15 or 16

Second Semester

- CHEM 328 Organic Chemistry II **Credits: (3-0) 3**
- CHEM 328L Organic Chemistry II Lab **Credits: (0-2) 2**
- BIOL 371 Genetics **Credits: (3-0) 3**
- BIOL 371L Genetics Lab **Credits: (0-1) 1**
- General Education Goal 3 or 4 Elective(s) **Credits: 3***
- PHYS 113 Introduction to Physics II **Credits: (3-0) 3**
- PHYS 113L Introduction to Physics II Laboratory **Credits: (0-1) 1**
- OR
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**
- PHYS 213L University Physics II Laboratory **Credits: (0-1) 1**

Total: 16

Junior Year

First Semester

- CHEM 464/564 Biochemistry I **Credits: (3-0) 3**
- CHEM 464L/564L Biochemistry I Lab **Credits: (0-1) 1**
- BIOL 446/546 Molecular Cell Biology **Credits: (3-0) 3**
- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1)*
- ABS Program Elective **Credits: 3**

Total: 13

Second Semester

- CHEM 465/565 Biochemistry II **Credits: (3-0) 3**
- MATH 321 Differential Equations **Credits: (3-0) 3**
OR
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**
- BIOL 480/580 Bioinformatics **Credits: (3-0) 3**
- General Education Goal 3 or 4 Elective(s) **Credits: 3***
- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 2)*

Total: 15

Senior Year

First Semester

- BIOL 490 Seminar **Credits: 1 to 3**
- ABS Program Elective **Credits: 9**
- Free Elective **Credits: 6**

Total: 16

Second Semester

- ABS Program Elective **Credits: 6 or 7**
- Free Elective **Credits: 7**

Total: 13 or 14

120 credits required for graduation

Curriculum Notes

*Fulfills General Education requirement. Students should consult the General Education Requirements section of this catalog for a complete listing of all general education requirements. ABS majors should consult their advisor to tailor an individualized curriculum based on their areas of interest and academic preparedness.

Math Requirement: 11 credits (MATH 123, 125, and 321 or 381)

Physics Requirement: 7 credits (100 or 200 level PHYS courses)

Chemistry Requirement: 25 credits (CHEM 112, 112L, 114, 114L, 326, 326L, 328, 328L, 464, 464L, and 465)

Biology Requirement: 24 credits (BIOL 111, 151, 151L, 153, 153L, 331, 331L, 371, 371L, 446, 480, and 490)

ABS Program Electives: 19 credits

Free Electives: 13 credits (Note that Free Electives may include Military Science (MSL), Physical Education (PE), Music (MUS), music ensemble (MUEN) courses, as well as others.)

Total 120 credits required for the ABS B.S.

ABS Program Electives

- AES 403/503 Biogeochemistry **Credits: (3-0) 3**
- BIOL 221 Human Anatomy **Credits: (3-0) 3**
- BIOL 221L Human Anatomy Lab **Credits: (0-1) 1**
- BIOL 311 Principles of Ecology **Credits: (3-0) 3**
- BIOL 311L Principles of Ecology Laboratory **Credits: (0-1) 1**
- BIOL 326 Biomedical Physiology **Credits: (3-0) 3**
- BIOL 326L Biomedical Physiology Lab **Credits: (0-1) 1**
- BIOL 375 Current Bioethical Issues **Credits: (3-0) 3**
- BIOL 406/506 Global Environmental Change **Credits: (3-0) 3**
- BIOL 423 Pathogenesis **Credits: (3-0) 3**
- BIOL 423L Pathogenesis Lab **Credits: (0-1) 1**
- BIOL 438/538 Industrial Microbiology **Credits: (3-0) 3**
- BIOL 455/555 DNA Structure and Function **Credits: (3-0) 3**
- BIOL 470/570 Cancer Biology **Credits: (3-0) 3**
- BIOL 478/578 Microbial Genetics **Credits: (3-0) 3**
- BIOL 491/591 Independent Study **Credits: 1 to 4**
- BIOL 492/592 Topics **Credits: 1 to 5**
- BIOL 498 Undergraduate Research/Scholarship **Credits: 1 to 12**
- BME 408/508 Biomedical Engineering **Credits: (3-0) 3**
- CBE 217 Chemical Engineering Material Balances **Credits: (3-0) 3**
- CBE 218 Chemical Engineering Fluid Mechanics **Credits: (3-0) 3**
- CBE 222 Chemical Engineering Process Thermodynamics **Credits: (3-0) 3**
- CBE 318 Chemical Engineering Mass Transfer **Credits: (3-0) 3**
- CBE 343 Chemical Kinetics and Reactor Design **Credits: (3-0) 3**

- CBE 484/584 Fundamentals of Biochemical Engineering **Credits: (3-0) 3**
- CBE 484L/584L Biochemical Engineering Laboratory **Credits: (0-1) 1**
- CHEM 352 Systematic Inorganic Chemistry **Credits: (3-0) 3**
- CHEM 332 Analytical Chemistry **Credits: 2 or 3**
- CHEM 332L Analytical Chemistry Lab **Credits: (0-1) 1**
- CHEM 342 Physical Chemistry I **Credits: 2 to 3**
- CHEM 342L Physical Chemistry I Lab **Credits: (0-1) 1**
- CHEM 344 Physical Chemistry II **Credits: 2 to 3**
- CHEM 344L Physical Chemistry II Lab **Credits: 1 to 2**
- CHEM 420/520 Organic Chemistry III **Credits: (3-0) 3**
- CHEM 421/521 Spectroscopic Analysis **Credits: (3-0) 3**
- CHEM 426/526 Polymer Chemistry **Credits: (3-0) 3**
- CHEM 434 Instrumental Analysis **Credits: (3-0) 3**
- CHEM 434L Instrumental Analysis Lab **Credits: (0-2) 2**
- CHEM 452/552 Inorganic Chemistry **Credits: (3-0) 3**
- CHEM 452L/552L Inorganic Chemistry Lab **Credits: (0-1) 1**
- CHEM 482/582 Environmental Chemistry **Credits: (3-0) 3**
- CP 297/397/497 Cooperative Education **Credits: 1 to 3**
- EM 215 Dynamics **Credits: (3-0) 3**
- EM 216 Statics and Dynamics **Credits: (4-0) 4**
- GEOL 361 Oceanography I **Credits: (3-0) 3**
- GEOL 416/416L/516/516L Introduction to GIS/Lab **Credits: (2-1) 3**
- IENG 321/321L Ergonomics/Human Factors Engineering/Lab **Credits: (2-1) 3**
- IENG 431/531 Industrial Hygiene **Credits: (3-0) 3**
- MATH 225 Calculus III **Credits: (4-0) 4**
- MATH 321 Differential Equations **Credits: (3-0) 3**
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**
- ME 211 Introduction to Thermodynamics **Credits: (3-0) 3**
- ME 216 Introduction to Solid Mechanics **Credits: (3-0) 3**
- ME 316 Solid Mechanics **Credits: (3-0) 3**
- ME 331 Thermo Fluid Dynamics **Credits: (3-0) 3**
- MET 232 Properties of Materials **Credits: (3-0) 3**
- MET 320 Metallurgical Thermodynamics **Credits: (4-0) 4**
- MET 422 Transport Phenomena **Credits: (4-0) 4**
- NANO 401 Introduction to Nanoscience **Credits: (3-0) 3**

Applied and Computational Mathematics, BS

Contact Information

Dr. Kyle Riley

Department of Mathematics and Computer Science
McLaury 308
(605) 394-2471
E-mail: Kyle.Riley@sdsmt.edu

Faculty

Professors Braman, Johnson, Kowalski, McGough, and Teets; Associate Professors Caudle, Garlick, Kliche and Riley; Assistant Professors Dahl, Deschamp, and Fleming; Lecturers Bienert, Richard-Greer, Grieve, Leonard; Instructors Lehmann, and Rudy-Hinker; Emerita Professor Logar; Emeritus Professors Carda, Corwin, and Opp.

To learn more about the department and the major then please check out the department webpage at <http://www.sdsmt.edu/MCS>.

Applied and Computational Mathematics Curriculum

For the bachelor of science in mathematics, a student must:

- Take all of the courses listed in the applied and computational mathematics curriculum checklist;
- Take 3 emphasis area courses (information about emphasis areas and supporting courses is available from the department); and
- Have a departmental grade point average of at least 2.00 in all mathematics courses 300 level or higher.
- All baccalaureate degrees must satisfy the general education requirements mandated by the Board of Regents. Please see the General Education Requirements in this catalog.
- Course requirements for the program also include the total number of credits per course. Any student that transfers a course that is approved for transfer will fulfill the course requirement, but if the transferred course does not meet the total credit hour requirement then the program committee will decide on the proper accommodation for meeting the credit requirement. Students should consult with their advisor to get clarification on the necessary accommodation.

Applied and Computational Mathematics Curriculum/Checklist

It is the student's responsibility to check with his or her advisor for any program modifications that may occur after the publication of this catalog.

Freshman Year

First Semester

- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1) ²
- MATH 110 Survey of Computer Science and Mathematics **Credits: (1-0) 1**
- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5) ²
- CSC 150/150L Computer Science I/Lab **Credits: (2-1) 3**
- Humanities/Social Science Elective(s) **Credits: 3** (Goal 3 or 4) ²

Total: 14

Second Semester

- MATH 125 Calculus II **Credits: (4-0) 4**
- Science Elective/Science Lab **Credits: 4** (Goal 6) ^{1,2}
- CSC 215 Programming Techniques **Credits: (4-0) 4**
- Humanities/Social Science Elective(s) **Credits: 3** (Goal 3 or 4) ²

Total: 15

Sophomore Year

First Semester

- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1) ²
- MATH 225 Calculus III **Credits: (4-0) 4**
- MATH 321 Differential Equations **Credits: (3-0) 3**
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3** (Goal 6) ²
- Humanities/Social Science Elective(s) **Credits: 3** (Goal 3 or 4) ²

Total: 16

Second Semester

- MATH 315 Linear Algebra **Credits: (3-0) 3**
- CSC 251 Finite Structures **Credits: 2 or 4** ⁴
- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 2) ²
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**
- Humanities/Social Science Elective(s) **Credits: 3** (Goal 3 or 4) ²

Total: 16

Junior Year

First Semester

- MATH 413 Abstract Algebra I **Credits: (3-0) 3**
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**
- MATH 373 Introduction to Numerical Analysis **Credits: (3-0) 3**
- MATH 452/552 Advanced Studies in Mathematics **Credits: (3-0) 3**
- Elective/Emphasis **Credits: 2** ³

Total: 15

Second Semester

- MATH 382 Probability Theory and Statistics II **Credits: (3-0) 3**
- MATH 443/543 Data Analysis **Credits: (3-0) 3**
- MATH 421 Complex Analysis **Credits: (3-0) 3**
- Elective/Emphasis **Credits: 5** ³

Total: 15

Senior Year

First Semester

- MATH 423 Advanced Calculus I **Credits: (4-0) 4**
- MATH 432/532 Partial Differential Equations **Credits: (3-0) 3**
- MATH 498 Undergraduate Research/Scholarship **Credits: (1-0) 1**
- Elective/Emphasis **Credits: 8** ³

Total: 15

Second Semester

- MATH 424 Advanced Calculus II **Credits: (4-0) 4**
- MATH 451/551 Math Modeling **Credits: (3-0) 3**
- MATH 402 Communicating Mathematics **Credits: (1-0) 1**
- Elective/Emphasis **Credits: 7**³

Total: 14

120 credits required for graduation

Curriculum Notes

¹The science requirement for this major consists of PHYS 211/211A, PHYS 213/213-A, one course from among BIOL 151, CHEM 112, GEOL 201, plus a lab associated with one of the science courses taken - either BIOL 151L, CHEM 112L, GEOL 201L, or PHYS 213L.

²Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements. Math majors are additionally required to take a total of at least 15 semester hours of electives in humanities and social sciences. At least three credits of humanities/social sciences must be at the 300 level or above.

³Math majors must complete at least 9 credits in coursework in a science or engineering emphasis area. Any dual or double major automatically satisfies this emphasis area requirement with their other major. Further information about possible emphasis areas is available from the department. Math majors are also required to complete at least three credits in a nontechnical elective. Nontechnical elective courses include: PE, Music, MSL, Humanities, or Social Sciences. Please note the nontechnical elective is in addition to the 15 credits of Humanities and Social Sciences that are required for the major.

⁴CSC 251 must be taken for four credits to apply towards the Applied and Computational Mathematics major.

⁵CHEM 106, CSC 105, MATH 021, MATH 101, MATH 102, MATH 120, PHYS 111, and PHYS 113 may not be counted towards the degree in Applied and Computational Mathematics.

Chemical Engineering, BS

Contact Information

Dr. Robb Winter, Department Head

Department of Chemical and Biological Engineering
(605) 394-2421

E-mail: Robb.Winter@sdsmt.edu

Web: <http://www.sdsmt.edu/CBE/>

Chemical and Biological Engineering (CBE)

The Department of Chemical and Biological Engineering (CBE) offers a BS degree in Chemical Engineering which is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>, 415 North Charles Street, Baltimore, MD 21201, Phone: +1.410.347.7700 . Our department name, Chemical and Biological Engineering, reflects the forward-looking integration of chemical engineering, chemical sciences and biological sciences. With a specialization in biochemical engineering and emphases in advanced materials, biomedical engineering, energy technology, environmental engineering, and petroleum engineering you can personalize your education. An accelerated Master of Science (B.S. + M.S.) degree program is also available for qualified undergraduate students.

Chemical Engineering Curriculum/Checklist

Although a minor in chemical engineering is not available, you can obtain a specialization in biochemical engineering or an emphasis in emerging areas such as advanced materials, biomedical engineering, energy technology, environmental engineering, or petroleum engineering by tailoring your elective courses.

Students are responsible for checking with their advisors for any program modifications that may occur after the publication of this catalog.

Freshman Year

First Semester

- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5)*
- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6)*
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1** (Goal 6)*
- CBE 111/111L Introduction to Chemical Process Modeling/Lab **Credits: (1-1) 2**
- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1)*
- General Education Goal 3 or 4 Elective(s) **Credits: 3***

Total: 16

Second Semester

- MATH 125 Calculus II **Credits: (4-0) 4**
- CHEM 114 General Chemistry II **Credits: (3-0) 3** (Goal 6)*
- CHEM 114L General Chemistry II Lab **Credits: (0-1) 1**
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3**
- CBE 117L Programming for Chemical and Biological Engineering **Credits: (0-1) 1**
- General Education Goal 3 or 4 Elective(s) **Credits: 6***

Total: 18

Sophomore Year

First Semester

- CBE 217 Chemical Engineering Material Balances **Credits: (3-0) 3**
- MATH 321 Differential Equations **Credits: (3-0) 3**
- Biology Elective **Credits: 3**
- CHEM 326 Organic Chemistry I **Credits: (3-0) 3**
- CHEM 220L Experimental Organic Chemistry IA **Credits: (0-1) 1**
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**

Total: 16

Second Semester

- CBE 218 Chemical Engineering Fluid Mechanics **Credits: (3-0) 3**
- CBE 222 Chemical Engineering Process Thermodynamics **Credits: (3-0) 3**
- CBE 250 Computer Applications in Chemical Engineering **Credits: (2-0) 2**
- CHEM 328 Organic Chemistry II **Credits: (3-0) 3**
- MATH 225 Calculus III **Credits: (4-0) 4**
- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1)*

Total: 18

Junior Year

First Semester

- CBE 317 Chemical Engineering Heat Transfer **Credits: (3-0) 3**
- CBE 321 Chemical Engineering Equilibrium Thermodynamics **Credits: (3-0) 3**
- CBE 333 Process Measurements and Control **Credits: (1-0) 1**
- CBE 333L Chemical Engineering Process Control Lab **Credits: (0-1) 1**
- CBE 361L Chemical Engineering Fluid Laboratory **Credits: (0-1) 1**
- CHEM 332 Analytical Chemistry **Credits: 2 or 3 (ChEs take 2 credit hours)**
- CHEM 332L Analytical Chemistry Lab **Credits: (0-1) 1**
- CHEM 342 Physical Chemistry I **Credits: 2 to 3 (ChEs take 2 credit hours)**
- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 2)*

Total: 17

Second Semester

- CBE 318 Chemical Engineering Mass Transfer **Credits: (3-0) 3**
- CBE 343 Chemical Kinetics and Reactor Design **Credits: (3-0) 3**
- CBE 362L Chemical Engineering Heat Transfer Laboratory **Credits: (0-1) 1**
- CBE 364 Chemical Process Design, Economics, and Safety **Credits: (2-0) 2**
- CHEM 344 Physical Chemistry II **Credits: 2 to 3 (ChEs take 2 credit hours)**
- CHEM 342L Physical Chemistry I Lab **Credits: (0-1) 1**
- **OR**
- CHEM 344L Physical Chemistry II Lab **Credits: 1 to 2 (ChEs take 1 credit hour)**
- Engineering Elective **Credits: 3**
- General Education Goal 3 or 4 Elective(s) **Credits: 3***

Total: 18

Senior Year

First Semester

- CBE 417 Chemical Engineering Equilibrium Separations **Credits: (2-0) 2**
- CBE 463 Process Design for Chemical Engineering **Credits: (1-1) 2**
- CBE 465 Advanced Process and Equipment Design **Credits: (2-0) 2**
- Chemical Engineering Elective **Credits: 3**
- Department Approved Elective **Credits: 3**

Total: 12

Second Semester

- CBE 433 Process Control **Credits: (3-0) 3**
- CBE 461L Chemical Engineering Mass Transfer and Reaction Engineering Laboratory **Credits: (0-1) 1**
- CBE 466 Capstone Design for Chemical Engineering **Credits: (0-2) 2**
- CBE 487 Global and Contemporary Issues in Chemical Engineering **Credits: 1-0) 1**
- Chemical Engineering Elective **Credits: 3**
- Chemical Engineering Lab Elective **Credits: 1**
- Department Approved Elective **Credits: 4**

Total: 15

130 credits required for graduation

Curriculum Notes

*Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

Optional emphases and specialization in ChE:

The academic advisor recommends and approves courses to take if students are interested in an emphasis in one of these areas: advanced materials (nano materials, polymers, ceramics, materials processing, corrosion, or solid state/semi-conductors), biomedical engineering, energy technology, environmental engineering, or petroleum engineering. A specialization in biochemical engineering is also offered.

Chemical Engineering: Biochemical Engineering Specialization, BS

BIOL Elective (3 cr hr):

Select from

- BIOL 341 Microbial Processes in Engineering and Natural Sciences **Credits: (3-0) 3** (preferred)
- BIOL 371 Genetics **Credits: (3-0) 3 OR**
- Other approved by advisor.

CHE Elective (6 cr hr):

Select 6 credits from

- CBE 424/524 Molecular Modeling and Simulation **Credits: (3-0) 3**
- CBE 434/534 Design of Separation Processes **Credits: (1-0) 1**
- CBE 434L/534L Design of Separation Processes Laboratory **Credits: (0-1) 1**
- CBE 444/544 Reactor Design **Credits: (3-0) 3**
- CBE 445/545 Oxidation and Corrosion of Metals **Credits: (3-0) 3**
- CBE 450/550 Systems Analysis Applied to Chemical Engineering **Credits: 2 to 3**
- CBE 455/555 Pollution Phenomena and Process Design **Credits: (3-0) 3**
- CBE 474/574 Polymer Technology **Credits: 2 to 3**
- CBE 474L/574L Experimental Polymer Technology **Credits: (0-1) 1**
- CBE 475/575 Advances in Processing and Nanoengineering of Polymers **Credits: (2-0) 2**
- CBE 476/576 Organosilicon Polymer Chemistry and Technology **Credits: (1-0) 1**
- CBE 482/582 Upstream Oil and Gas Processing **Credits: 1 or 3**
- CBE 483/583 Petroleum Refining **Credits: 2 or 3**
- CBE 484/584 Fundamentals of Biochemical Engineering **Credits: (3-0) 3**
- CBE 484L/584L Biochemical Engineering Laboratory **Credits: (0-1) 1**
- CBE 485/585 Renewable and Sustainable Energy **Credits: (3-0) 3**
- CBE 485L/585L Renewable and Sustainable Energy Lab **Credits: (0-1) 1**
- CBE 486/586 Immuno-Engineering **Credits: 2 or 3**
- CBE 488/588 Applied Design of Experiments for the Chemical Industry **Credits: (2-0) 2**
- CBE 489/589 Composites Manufacturing **Credits: (1-0) 1**
- CBE 491 Independent Study **Credits: 1 to 3**
- CBE 492 Topics **Credits: 1 to 3**
- CBE 498 Undergraduate Research/Scholarship **Credits: Credit to be arranged. OR**
- Others approved by advisor.

CHE Lab Elective (1 cr hr):

Select 1 credit from

- CBE 434L/534L Design of Separation Processes Laboratory **Credits: (0-1) 1**
- CBE 474L/574L Experimental Polymer Technology **Credits: (0-1) 1**
- CBE 484L/584L Biochemical Engineering Laboratory **Credits: (0-1) 1**
- CBE 485L/585L Renewable and Sustainable Energy Lab **Credits: (0-1) 1**
- CBE 498 Undergraduate Research/Scholarship **Credits: Credit to be arranged. OR**
- Other approved by advisor.

Engineering Elective (3 cr hr):

Select 3 credits from engineering courses other than CBE prefix; requires advisor approval. These courses are typically at a 200 level or higher.

Department Approved Elective (7 cr hr):

Select from the following: CBE, or other approved courses to fulfill emphasis electives. These courses are typically at a 120 level or higher. May include:

- CP 297/397/497 Cooperative Education **Credits: 1 to 3 ***
- Up to three (3) credits of advanced military science **Credits: 1 to 3**
- Up to three (3) credits 300 level or above Humanities, Social Science or Business **Credits: 1 to 3**
- One (1) credit of Physical Education (PE) or Music Ensemble (MUEN)
- EXPL 285/385/485/585/685 Study Abroad Experiences **Credits: 1 to 3**

*Can take up to six (6) credits maximum

Chemical Engineering: Biochemical Engineering Specialization, BS

Contact Information

Dr. Patrick Gilcrease

Department of Chemical and Biological Engineering

(605) 394-1239

E-mail: Patrick.Gilcrease@sdsmt.edu

Web: <https://www.sdsmt.edu/CBE/>

Background Requirements

The specialization is available to undergraduate chemical engineering students at SD Mines and others that meet the prerequisites for the course requirements. Students should work with their advisor for the application procedure and appropriate forms.

Program Requirements

The biochemical engineering specialization requires completion of 12 credits of course work from the requirement lists below in replacement of various electives of the main Chemical Engineering major. See your advisor for further details.

Microbiology Requirement

- BIOL 341 Microbial Processes in Engineering and Natural Sciences **Credits: (3-0) 3**
OR
- BIOL 331 Microbiology **Credits: (3-0) 3**

Chemical and Biological Engineering Requirements

- CBE 484/584 Fundamentals of Biochemical Engineering **Credits: (3-0) 3**
- CBE 484L/584L Biochemical Engineering Laboratory **Credits: (0-1) 1**
AND two credits from:
- CBE 486/586 Immuno-Engineering **Credits: 2 or 3**
OR
- CBE 434/534 Design of Separation Processes **Credits: (1-0) 1**
- CBE 434L/534L Design of Separation Processes Laboratory **Credits: (0-1) 1**

Science Requirement

- CHEM 464/564 Biochemistry I **Credits: (3-0) 3**
OR
- BIOL 371 Genetics **Credits: (3-0) 3**
OR
- BIOL 438/538 Industrial Microbiology **Credits: (3-0) 3**

Chemical Engineering, BS

Contact Information

Dr. Robb Winter, Department Head

Department of Chemical and Biological Engineering

(605) 394-2421

E-mail: Robb.Winter@sdsmt.edu

Web: <http://www.sdsmt.edu/CBE/>

Chemical and Biological Engineering (CBE)

The Department of Chemical and Biological Engineering (CBE) offers a BS degree in Chemical Engineering which is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>, 415 North Charles Street, Baltimore, MD 21201, Phone: +1.410.347.7700 . Our department name, Chemical and Biological Engineering, reflects the forward-looking integration of chemical engineering, chemical sciences and biological sciences. With a specialization in biochemical engineering and emphases in advanced materials, biomedical engineering, energy technology, environmental engineering, and petroleum engineering you can personalize your education. An accelerated Master of Science (B.S. + M.S.) degree program is also available for qualified undergraduate students.

Chemical Engineering Curriculum/Checklist

Although a minor in chemical engineering is not available, you can obtain a specialization in biochemical engineering or an emphasis in emerging areas such as advanced materials, biomedical engineering, energy technology, environmental engineering, or petroleum engineering by tailoring your elective courses.

Students are responsible for checking with their advisors for any program modifications that may occur after the publication of this catalog.

Freshman Year

First Semester

- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5)*
- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6)*
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1** (Goal 6)*
- CBE 111/111L Introduction to Chemical Process Modeling/Lab **Credits: (1-1) 2**
- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1)*
- General Education Goal 3 or 4 Elective(s) **Credits: 3***

Total: 16

Second Semester

- MATH 125 Calculus II **Credits: (4-0) 4**
- CHEM 114 General Chemistry II **Credits: (3-0) 3** (Goal 6)*
- CHEM 114L General Chemistry II Lab **Credits: (0-1) 1**
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3**
- CBE 117L Programming for Chemical and Biological Engineering **Credits: (0-1) 1**
- General Education Goal 3 or 4 Elective(s) **Credits: 6***

Total: 18

Sophomore Year

First Semester

- CBE 217 Chemical Engineering Material Balances **Credits: (3-0) 3**
- MATH 321 Differential Equations **Credits: (3-0) 3**
- Biology Elective **Credits: 3**
- CHEM 326 Organic Chemistry I **Credits: (3-0) 3**
- CHEM 220L Experimental Organic Chemistry IA **Credits: (0-1) 1**
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**

Total: 16

Second Semester

- CBE 218 Chemical Engineering Fluid Mechanics **Credits: (3-0) 3**
- CBE 222 Chemical Engineering Process Thermodynamics **Credits: (3-0) 3**
- CBE 250 Computer Applications in Chemical Engineering **Credits: (2-0) 2**
- CHEM 328 Organic Chemistry II **Credits: (3-0) 3**
- MATH 225 Calculus III **Credits: (4-0) 4**
- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1)*

Total: 18

Junior Year

First Semester

- CBE 317 Chemical Engineering Heat Transfer **Credits: (3-0) 3**
- CBE 321 Chemical Engineering Equilibrium Thermodynamics **Credits: (3-0) 3**
- CBE 333 Process Measurements and Control **Credits: (1-0) 1**

- CBE 333L Chemical Engineering Process Control Lab **Credits: (0-1) 1**
- CBE 361L Chemical Engineering Fluid Laboratory **Credits: (0-1) 1**
- CHEM 332 Analytical Chemistry **Credits: 2 or 3 (ChEs take 2 credit hours)**
- CHEM 332L Analytical Chemistry Lab **Credits: (0-1) 1**
- CHEM 342 Physical Chemistry I **Credits: 2 to 3 (ChEs take 2 credit hours)**
- ENGL 289 Technical Communications II **Credits: (3-0) 3 (Goal 2)***

Total: 17

Second Semester

- CBE 318 Chemical Engineering Mass Transfer **Credits: (3-0) 3**
- CBE 343 Chemical Kinetics and Reactor Design **Credits: (3-0) 3**
- CBE 362L Chemical Engineering Heat Transfer Laboratory **Credits: (0-1) 1**
- CBE 364 Chemical Process Design, Economics, and Safety **Credits: (2-0) 2**
- CHEM 344 Physical Chemistry II **Credits: 2 to 3 (ChEs take 2 credit hours)**
- CHEM 342L Physical Chemistry I Lab **Credits: (0-1) 1**
- **OR**
- CHEM 344L Physical Chemistry II Lab **Credits: 1 to 2 (ChEs take 1 credit hour)**
- Engineering Elective **Credits: 3**
- General Education Goal 3 or 4 Elective(s) **Credits: 3***

Total: 18

Senior Year

First Semester

- CBE 417 Chemical Engineering Equilibrium Separations **Credits: (2-0) 2**
- CBE 463 Process Design for Chemical Engineering **Credits: (1-1) 2**
- CBE 465 Advanced Process and Equipment Design **Credits: (2-0) 2**
- Chemical Engineering Elective **Credits: 3**
- Department Approved Elective **Credits: 3**

Total: 12

Second Semester

- CBE 433 Process Control **Credits: (3-0) 3**
- CBE 461L Chemical Engineering Mass Transfer and Reaction Engineering Laboratory **Credits: (0-1) 1**
- CBE 466 Capstone Design for Chemical Engineering **Credits: (0-2) 2**
- CBE 487 Global and Contemporary Issues in Chemical Engineering **Credits: 1-0) 1**
- Chemical Engineering Elective **Credits: 3**
- Chemical Engineering Lab Elective **Credits: 1**
- Department Approved Elective **Credits: 4**

Total: 15

130 credits required for graduation

Curriculum Notes

*Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

Optional emphases and specialization in ChE:

The academic advisor recommends and approves courses to take if students are interested in an emphasis in one of these areas: advanced materials (nano materials, polymers, ceramics, materials processing, corrosion, or solid state/semi-conductors), biomedical engineering, energy technology, environmental engineering, or petroleum engineering. A specialization in biochemical engineering is also offered.

Chemical Engineering: Biochemical Engineering Specialization, BS

BIOL Elective (3 cr hr):

Select from

- BIOL 341 Microbial Processes in Engineering and Natural Sciences **Credits: (3-0) 3** (preferred)
- BIOL 371 Genetics **Credits: (3-0) 3 OR**
- Other approved by advisor.

CHE Elective (6 cr hr):

Select 6 credits from

- CBE 424/524 Molecular Modeling and Simulation **Credits: (3-0) 3**
- CBE 434/534 Design of Separation Processes **Credits: (1-0) 1**
- CBE 434L/534L Design of Separation Processes Laboratory **Credits: (0-1) 1**
- CBE 444/544 Reactor Design **Credits: (3-0) 3**
- CBE 445/545 Oxidation and Corrosion of Metals **Credits: (3-0) 3**
- CBE 450/550 Systems Analysis Applied to Chemical Engineering **Credits: 2 to 3**
- CBE 455/555 Pollution Phenomena and Process Design **Credits: (3-0) 3**
- CBE 474/574 Polymer Technology **Credits: 2 to 3**
- CBE 474L/574L Experimental Polymer Technology **Credits: (0-1) 1**
- CBE 475/575 Advances in Processing and Nanoengineering of Polymers **Credits: (2-0) 2**
- CBE 476/576 Organosilicon Polymer Chemistry and Technology **Credits: (1-0) 1**
- CBE 482/582 Upstream Oil and Gas Processing **Credits: 1 or 3**
- CBE 483/583 Petroleum Refining **Credits: 2 or 3**
- CBE 484/584 Fundamentals of Biochemical Engineering **Credits: (3-0) 3**
- CBE 484L/584L Biochemical Engineering Laboratory **Credits: (0-1) 1**
- CBE 485/585 Renewable and Sustainable Energy **Credits: (3-0) 3**
- CBE 485L/585L Renewable and Sustainable Energy Lab **Credits: (0-1) 1**
- CBE 486/586 Immuno-Engineering **Credits: 2 or 3**
- CBE 488/588 Applied Design of Experiments for the Chemical Industry **Credits: (2-0) 2**
- CBE 489/589 Composites Manufacturing **Credits: (1-0) 1**
- CBE 491 Independent Study **Credits: 1 to 3**
- CBE 492 Topics **Credits: 1 to 3**
- CBE 498 Undergraduate Research/Scholarship **Credits: Credit to be arranged. OR**
- Others approved by advisor.

CHE Lab Elective (1 cr hr):

Select 1 credit from

- CBE 434L/534L Design of Separation Processes Laboratory **Credits: (0-1) 1**
- CBE 474L/574L Experimental Polymer Technology **Credits: (0-1) 1**
- CBE 484L/584L Biochemical Engineering Laboratory **Credits: (0-1) 1**
- CBE 485L/585L Renewable and Sustainable Energy Lab **Credits: (0-1) 1**
- CBE 498 Undergraduate Research/Scholarship **Credits: Credit to be arranged. OR**
- Other approved by advisor.

Engineering Elective (3 cr hr):

Select 3 credits from engineering courses other than CBE prefix; requires advisor approval. These courses are typically at a 200 level or higher.

Department Approved Elective (7 cr hr):

Select from the following: CBE, or other approved courses to fulfill emphasis electives. These courses are typically at a 120 level or higher. May include:

- CP 297/397/497 Cooperative Education **Credits: 1 to 3 ***
- Up to three (3) credits of advanced military science **Credits: 1 to 3**
- Up to three (3) credits 300 level or above Humanities, Social Science or Business **Credits: 1 to 3**
- One (1) credit of Physical Education (PE) or Music Ensemble (MUEN)
- EXPL 285/385/485/585/685 Study Abroad Experiences **Credits: 1 to 3**
- *Can take up to six (6) credits maximum

Chemistry, BS

Contact Information

Lori D. Coble, Interim Department Head

Department of Chemistry and Applied Biological Sciences

Chemical and Biological Engineering/Chemistry 3317

Office Phone: 605-394-5132

E-mail: Lori.Coble@sdsmt.edu

Chemistry Curriculum/Checklist

The following shows the preferred curriculum for the Chemistry B.S. degree. The sequence of courses taken will depend on the academic preparation of incoming students. Students should consult with a Chemistry advisor for their individualized course of study. It is important to note that certain courses have prerequisite requirements. Moreover, as certain courses are taught every two years, curricula are shown for the junior and senior years for both even and odd year cycles.

Freshman Year

First Semester

- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6) ⁵
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1** (Goal 6) ⁵
- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1) ⁵
- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5) ⁵
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ⁵
- CHEM 111 Introduction to Chemistry and Applied Biological Sciences **Credits: (1-0) 1**

Total: 15

Second Semester

- CHEM 114 General Chemistry II **Credits: (3-0) 3** (Goal 6) ⁵
- CHEM 114L General Chemistry II Lab **Credits: (0-1) 1**
- MATH 125 Calculus II **Credits: (4-0) 4**
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ⁵

Total: 14

Sophomore Year

First Semester

- CHEM 332 Analytical Chemistry **Credits: 2 or 3** ³
- CHEM 332L Analytical Chemistry Lab **Credits: (0-1) 1**
- CHEM 326 Organic Chemistry I **Credits: (3-0) 3**
- CHEM 326L Organic Chemistry I Lab **Credits: (0-2) 2**
- MATH 321 Differential Equations **Credits: (3-0) 3**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ⁵

Total: 15

Second Semester

- CHEM 328 Organic Chemistry II **Credits: (3-0) 3**
- CHEM 328L Organic Chemistry II Lab **Credits: (0-2) 2**
- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1) ⁵
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**
- PHYS 213L University Physics II Laboratory **Credits: (0-1) 1**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ⁵

Total: 15

Junior Year

First Semester - Odd Years

- CHEM 352 Systematic Inorganic Chemistry **Credits: (3-0) 3**
- CHEM 342 Physical Chemistry I **Credits: 2 to 3** ³
- CHEM 342L Physical Chemistry I Lab **Credits: (0-1) 1**
- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 2) ⁵
- Elective(s) **Credits: 3** ¹
- CHEM 420/520 Organic Chemistry III **Credits: (3-0) 3** ²
- **OR**
- Elective(s) **Credits: 3** ¹

Total: 16

Second Semester - Odd Years

- CHEM 344 Physical Chemistry II **Credits: 2 to 3** ³
 - CHEM 344L Physical Chemistry II Lab **Credits: 1 to 2** ⁴
 - CHEM 452/552 Inorganic Chemistry **Credits: (3-0) 3**
 - CHEM 452L/552L Inorganic Chemistry Lab **Credits: (0-1) 1**
 - Elective(s) **Credits: 6** ¹
 - CHEM 421/521 Spectroscopic Analysis **Credits: (3-0) 3** ²
- OR**
- Elective(s) **Credits: 3** ¹

Total: 17

First Semester - Even Years

- CHEM 352 Systematic Inorganic Chemistry **Credits: (3-0) 3**
- CHEM 342 Physical Chemistry I **Credits: 2 to 3** ³
- CHEM 342L Physical Chemistry I Lab **Credits: (0-1) 1**
- ENGL 289 Technical Communications II **Credits: (3-0) 3**
- CHEM 482/582 Environmental Chemistry **Credits: (3-0) 3**
- Elective(s) **Credits: 3** ¹

Total: 16

Second Semester - Even Years

- CHEM 344 Physical Chemistry II **Credits: 2 to 3** ³
- CHEM 344L Physical Chemistry II Lab **Credits: 1 to 2** ⁴
- CHEM 370 Chemical Literature **Credits: (1-0) 1**
- CHEM 434 Instrumental Analysis **Credits: (3-0) 3**
- CHEM 434L Instrumental Analysis Lab **Credits: (0-2) 2**
- Elective(s) **Credits: 7** ¹

Total: 17

Senior Year

First Semester - Odd Years

- CHEM 464/564 Biochemistry I **Credits: (3-0) 3**
- Elective(s) **Credits: 9**¹
- CHEM 420/520 Organic Chemistry III **Credits: (3-0) 3**²
OR
- Elective **Credits: 3**¹

Total: 15

Second Semester - Odd Years

- CHEM 452/552 Inorganic Chemistry **Credits: (3-0) 3**
- CHEM 452L/552L Inorganic Chemistry Lab **Credits: (0-1) 1**
- Elective(s) **Credits: 2**¹
- CHEM 421/521 Spectroscopic Analysis **Credits: (3-0) 3**²
OR
- Elective(s) **Credits: 3**¹
- CHEM 465/565 Biochemistry II **Credits: (3-0) 3**²
OR
- Elective(s) **Credits: 3**¹

Total: 12

First Semester - Even Years

- CHEM 482/582 Environmental Chemistry **Credits: (3-0) 3**
- CHEM 464/564 Biochemistry I **Credits: (3-0) 3**
- Elective(s) **Credits: 9**¹

Total: 15

Second Semester - Even Years

- CHEM 370 Chemical Literature **Credits: (1-0) 1**
- CHEM 434 Instrumental Analysis **Credits: (3-0) 3**
- CHEM 434L Instrumental Analysis Lab **Credits: (0-2) 2**
- Elective(s) **Credits: 4**¹
- CHEM 465/565 Biochemistry II **Credits: (3-0) 3**²

Total: 13

120 credits required for graduation

Curriculum Notes

¹ Twenty-seven (27) elective credits are required. These electives can be used to tailor a degree to meet requirements for pursuit of an advanced degree. Note that electives may include Military Science (MSL), Physical Education (PE), Music (MUS), music ensemble (MUEN) courses.

² Three credits of advanced chemistry electives are required. Take any one of the following courses:

CHEM 420/520 Organic Chemistry III
CHEM 421/521 Spectroscopic Analysis
CHEM 426/526 Polymer Chemistry
CHEM 465/565 Biochemistry II

³ Three credit option is needed for the Chemistry major or minor.

⁴ The two credit option is encouraged as CHEM 342L may be phased out of the Chemistry major.

⁵ Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

Civil Engineering, BS

Contact Information

Dr. Scott J. Kenner, P.E.

Professor and Head

Department of Civil and Environmental Engineering

Civil/Mechanical 122

(605) 394-1697

E-mail: Scott.Kenner@sdsmt.edu

Lois Arneson-Meyer

Freshmen/ Sophomore Advisor, Assistant Professor

Department of Civil and Environmental Engineering

Civil/Mechanical 121

(605) 394-2446

E-mail: Lois.Arneson-Meyer@sdsmt.edu

A full description of the Civil and environmental Engineering program can be found on the program information page and on the department web site.

Civil Engineering Curriculum/Checklist

The Department of Civil and Environmental Engineering (CEE) offers a BS degree in Civil Engineering which is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>, 415 North Charles Street, Baltimore, MD 21201; Phone +1.410.347.7700. The civil and environmental engineering curriculum includes courses in the liberal arts, higher mathematics, basic sciences, engineering sciences, and engineering design. Civil and environmental engineers often work on interdisciplinary teams to solve complex system design problems, so a broad background in engineering fundamentals and the natural sciences is essential. Students will take courses in environmental, geotechnical, water resources, structures, construction, and sustainable engineering. Students interested in emphasizing environmental engineering may follow a curriculum specifically tailored to this important sub-disciplinary area which includes alternative courses in chemistry and biological sciences and chemical engineering.

In the senior year, a capstone design course allows students to work in multi-disciplinary teams to develop alternative solutions, incorporate sustainable design principles, perform feasibility and economic analyses, and create detailed designs. The capstone design experience culminates with a formal final written report and a presentation to the faculty and student peers.

Students are responsible for checking with their advisors for any program modifications that may occur after the publication of this catalog. Other advising information is available through the department.

Students pursuing a traditional civil engineering education will follow the CE General curriculum, students emphasizing environmental engineering will follow the CE ENVE curriculum. The curriculum below identifies semester by semester a) courses required for both CE General and CE ENVE Emphasis, b) CE General only course work and c) CE ENVE only course work. The total credit hours for each semester identifies the CE General/CE ENVE totals, respectively.

Freshman Year

First Semester

CE General and CE ENVE Emphasis:

- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1) ¹
- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6) ¹
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1** (Goal 6) ¹
- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5) ^{1,2}
- CEE 130/130L Introduction to Civil and Environmental Engineering/Lab **Credits: (1-1) 2**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ¹

Total: 16/16

Second Semester

CE General and CE ENVE Emphasis:

- CHEM 114 General Chemistry II **Credits: (3-0) 3** (Goal 5) ¹
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3**
- MATH 125 Calculus II **Credits: (4-0) 4**
- EM 214 Statics **Credits: (3-0) 3** ²
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ¹

CE General Only:

- CEE 117/117L Introduction to CADD/Lab **Credits: (1-1) 2**

CE ENVE Emphasis Only:

- CHEM 114L General Chemistry II Lab **Credits: (0-1) 1**

Total: 18/17

Sophomore Year

First Semester

CE General and ENVE Emphasis:

- MATH 225 Calculus III **Credits: (4-0) 4**
- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1) ¹
- EM 331 Fluid Mechanics **Credits: (3-0) 3** ²
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ¹

CE General Only:

- CEE 206/206L Engineering Surveys I/Lab **Credits: (2-1) 3**

CE ENVE Emphasis Only:

- CHEM 332 Analytical Chemistry **Credits: 2 or 3**
- CBE 217 Chemical Engineering Material Balances **Credits: (3-0) 3**

Total: 16/18

Second Semester

CE General and CE ENVE Emphasis:

- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 2) ¹
- CEE 284 Applied Numerical Methods **Credits: (3-0) 3**
- MATH 321 Differential Equations **Credits: (3-0) 3**
- EM 321 Mechanics of Materials **Credits: (3-0) 3** ²
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ¹

CE General Only:

- ME 221 Dynamics of Mechanisms **Credits: (3-0) 3**

CE ENVE Emphasis Only:

- CBE 222 Chemical Engineering Process Thermodynamics **Credits: (3-0) 3**

Total: 18/18

Junior Year

First Semester

CE General and CE ENVE Emphasis:

- CEE 316/316L Engineering and Construction Materials/Lab **Credits: (2-1) 3**
- CEE 326 Environmental Engineering I **Credits: (3-0) 3²**
- CEE 336/336L Hydraulic Systems Design/Lab **Credits: (2-1) 3²**
- CEE 346/346L Geotechnical Engineering/Lab **Credits: (2-1) 3²**

CE General Only:

- CEE 353 Structural Theory **Credits: (3-0) 3²**

CE ENVE Emphasis Only:

- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**

Total: 15/15

Second Semester

CE General and CE ENVE Emphasis:

- CEE 325 Introduction to Sustainable Design **Credits: (3-0) 3**
- GEOE 221/221L Geology for Engineers/Lab **Credits: (2-1) 3**
- OR**
- GEOL 201 Physical Geology **Credits: (3-0) 3**

CE General Only - Three of the following four courses (9 credits):

- CEE 327/327L Environmental Engineering II/Lab **Credits: (2-1) 3**
- CEE 337 Engineering Hydrology **Credits: (3-0) 3**
- CEE 347 Geotechnical Engineering II **Credits: (3-0) 3**
- CEE 456 Concrete Theory & Design **Credits: (3-0) 3**

CE ENVE Only:

- CEE 327/327L Environmental Engineering II/Lab **Credits: (2-1) 3**
- CEE 337 Engineering Hydrology **Credits: (3-0) 3**
- CEE 426/526 Environmental Engineering Unit Operations and Processes **Credits: (3-0) 3**

Total: 15/15

Senior Year

First Semester

CE General and CE ENVE Emphasis:

- CEE 463 Concepts of Professional Practice **Credits: (2-0) 2**

CE General Only:

- IENG 302 Engineering Economics **Credits: (3-0) 3**
- CEE Department Approved Elective(s) **Credits: 6³**
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**
- Advanced (300/400-level) Humanities or Social Sciences Elective **Credit: 3**

CE ENVE Only:

- IENG 301 Basic Engineering Economics **Credits: (2-0) 2**
- CEE 427/527 Environmental Engineering Biological Process Design **Credits: (3-0) 3**
- CEE Department Approved Elective(s) **Credits: 9²**

Total: 17/16

Second Semester

- CEE 474/574 Construction Engineering and Management **Credits: (3-0) 3**
- CEE 489 Capstone Design Project **Credits: (0-3) 3⁴**

CE General Only:

- Science/Math Elective **Credits: 3⁵**
- CEE Department Approved Elective(s) **Credits: 6³**

CE ENVE Emphasis Only:

- Advanced (300/400-level) Humanities or Social Sciences Elective **Credit: 3 AND**
Two courses selected from the following courses (6 credits):
- BIOL 341 Microbial Processes in Engineering and Natural Sciences **Credits: (3-0) 3**
- CHEM 326 Organic Chemistry I **Credits: (3-0) 3**
- IENG 331 Safety Engineering **Credits: (3-0) 3**
- CEE 428/528 Oil and Gas Development and the Environment **Credits: (3-0) 3**
- CHEM 482/582 Environmental Chemistry **Credits: (3-0) 3**
- CEE 492 Topics **Credits: 1 to 3**
- CEE 475/475L/575/575L Groundwater/Lab **Credits: (2-1) 3**
- CBE 455/555 Pollution Phenomena and Process Design **Credits: (3-0) 3**
- MEM 405 Mine Permitting and Reclamation **Credits: (3-0) 3**

Total: 15/15

130 credits required for graduation

Curriculum Notes

¹ Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

² Students must earn a "C" or better in the following courses to advance in the program: MATH 123, EM 214, EM 321, EM 331, CEE 326, CEE 336/336L, CEE 346/346L, CEE 353.

³ The civil engineering undergraduate curriculum includes 12 credit hours of Department Approved Electives (15 credit hours for the ENVE Emphasis) that students may use to gain knowledge and skills in a specialized area to meet their individual career goals. Students may participate in undergraduate research or scholarship, which may include international design projects or cooperative education. *See list below for further detail on department approved electives.* Students must apply for the cooperative education program prior to starting work. For more information about the cooperative education program, contact Dr. Scott Kenner (Scott.Kenner@sdsmt.edu).

- At least 9 credits of CEE 400-level or above coursework not applied to another CEE graduation requirement.
- Up to 6 credit hours of CEE 498 (Undergraduate Research/Scholarship), CEE 491 (Independent Study) or CP 297/397/497 (Cooperative Education); not more than 3 credits may be CEE 491 or CP 497.
- Up to 3 credit hours of 300, 400, 500, or 600 level courses in engineering, science, math or computer science not applied to another CEE graduation requirement.

⁴ Prerequisites for CEE 489 are: CEE 326, CEE 336/336L, and CEE 346/346L all with a "C" or better.

⁵ Basic sciences are defined as biological, chemical and physical sciences. A list of applicable basic science electives can be found at Basic science electives.

Department Approved Electives

Department Approved Electives include the following which are described in more detail on the department web page: <http://www.sdsmt.edu/Academics/Departments/Civil-and-Environmental-Engineering/Curriculum-and-Checklists/>

- CEE 425/525 Sustainable Engineering **Credits: (3-0) 3**
- CEE 426/526 Environmental Engineering Unit Operations and Processes **Credits: (3-0) 3**
- CEE 427/527 Environmental Engineering Biological Process Design **Credits: (3-0) 3**
- CEE 428/528 Oil and Gas Development and the Environment **Credits: (3-0) 3**
- CEE 433/533 Open Channel Flow **Credits: (3-0) 3**
- CEE 437/437L/537/537L Watershed and Floodplain Modeling/Lab **Credits: (2-1) 3**
- CEE 447/547 Foundation Engineering **Credits: (3-0) 3**
- CEE 448/548 Applied Geotechnical Engineering **Credits: (3-0) 3**
- CEE 451/551 Design of Wood Structures **Credits: (3-0) 3**
- CEE 453/553 Design of Steel Structures **Credits: (3-0) 3**
- CEE 457/557 Indeterminate Structures **Credits: (3-0) 3**
- CEE 468/568 Highway Engineering **Credits: (3-0) 3**
- CEE 475/475L/575/575L Groundwater/Lab **Credits: (2-1) 3**
- CEE 492 Topics **Credits: 1 to 3**

Computer Engineering, BS

ECE Contact Information

Magesh T. Rajan

ECE Department Head and Professor
Electrical Engineering/Physics 311
Phone: (605) 394-1219;
E-mail: Magesh.Rajan@sdsmt.edu

Thomas P Montoya

ECE Undergraduate Program Coordinator & Associate Professor
Electrical Engineering/Physics 325
Phone: (605) 394-2459;
Email: Thomas.Montoya@sdsmt.edu

Computer Engineering Curriculum/Checklist

The bachelor of science program in computer engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>, 415 North Charles Street, Baltimore, MD 21201; Phone +1.410.347.7700.

Students are responsible for checking with their advisors for any program modifications that may occur after the publication of this catalog.

Freshman Year

First Semester

- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5) ³
- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6) ³
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1** (Goal 6) ³
- CENG 244/244L Introduction to Digital Systems/Lab **Credits: (3-1) 4**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ³

Total: 15

Second Semester

- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1) ³
- MATH 125 Calculus II **Credits: (4-0) 4**
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3** (Goal 6) ³
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ³
- CSC 150/150L Computer Science I/Lab **Credits: (2-1) 3**

Total: 16

Sophomore Year

First Semester

- EE 220/220L Circuits I/Lab **Credits: (3-1) 4**
- MATH 321 Differential Equations **Credits: (3-0) 3**
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**
- PHYS 213L University Physics II Laboratory **Credits: (0-1) 1**
- CENG 264L Electromechanical Systems Product Development and Design Lab **Credits: (0-2) 2**
- CSC 215 Programming Techniques **Credits: (4-0) 4**

Total: 17

Second Semester

- CSC 251 Finite Structures **Credits: 2 or 4** ²
- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1) ³
- EE 221/221L Circuits II/Lab **Credits: (3-1) 4**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ³
- MATH 225 Calculus III **Credits: (4-0) 4**

Total: 18

Junior Year

First Semester

- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 2) ³
- EE 320/320L Electronics I/Lab **Credits: (3-1) 4**
- EE 313 Signals and Systems **Credits: (3-0) 3**
- CENG 351/351L Mechatronics and Measurement Systems **Credits: (3-1) 4**
- CSC 315 Data Structures & Algorithms **Credits: (4-0) 4**

Total: 18

Second Semester

- EM 216 Statics and Dynamics **Credits: (4-0) 4**
- EE 314/314L Control Systems/Lab **Credits: (3-1) 4**
- CENG 447/447L/547/547L Embedded Systems **Credits: (3-1) 4**
- CENG 342/342L Digital Systems/Lab **Credits: (3-1) 4**

Total: 16

Senior Year

First Semester

- IENG 301 Basic Engineering Economics **Credits: (2-0) 2**
- CENG 464 Senior Design Project I **Credits: (0-2) 2**
- CENG Senior Elective(s) **Credits: 4**
- CENG 448/448L/548/548L Real-Time Operating Systems **Credits: (3-1) 4**
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**

Total: 15

Second Semester

- CENG 465 Senior Design Project II **Credits: (0-2) 2**
- CENG Senior Elective(s) **Credits: 7**
- General Education Goal 3 or 4 Elective(s) **Credits: 3**³
- Approved Math/Sciences Electives: **Credits: 3**¹

Total: 15

130 credits required for graduation

Curriculum Notes¹ Approved basic math/science courses must be at 300-level or higher with prefixes MATH, PHYS, CHEM.

² Four (4) credit version is required for CENG majors.

³ Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

CENG Senior Electives

Any regular CENG, CSC, or EE 4xx, dual-listed 5xx, or 6xx course may be used toward the CENG senior electives requirement with the exceptions of CENG 464/CSC 464/EE 464, CENG 465/CSC 465/EE 465, CENG 447/447L/547/547L, CENG 448/448L/548/548L, and EE 505/505L. A maximum of four (4) co-op credits, CENG/CSC/EE 491/591/691, CENG/CSC/EE 492/592/692, and/or CENG/CSC/EE 498 may be used toward the CENG senior electives requirement if a written request presented by the student is approved by the ECE faculty. The student request must justify that the CENG design requirement is met. Additional courses approved toward the CENG senior electives requirement are listed below.

- CSC 314/314L Assembly Language/Lab **Credits: (2-1) 3**
- CSC 340 Software Engineering and Design **Credits: (3-0) 3**
- EE 322/322L Electronics II/Lab **Credits: (3-1) 4**
- EE 330/330L Energy Systems/Lab **Credits: (3-1) 4**
- EE 362 Electric and Magnetic Properties of Materials **Credits: (3-0) 3**
- EE 381 Electric and Magnetic Fields **Credits: (3-0) 3**
- EE 382 Applied Electromagnetics **Credits: (3-0) 3**

Computer Science, BS

Contact Information

Dr. Kyle Riley

Department of Mathematics and Computer Science
McLaury 308
(605) 394-2471
E-mail: Kyle.Riley@sdsmt.edu

Faculty

Professors McGough; Associate Professors Pyeatt and Qiao; Assistant Professors de Castro, Karlsson, Hinker, and Rebenitsch; Lecturer Schrader; Emerita Professor Logar; Emeritus Professors Carda, Corwin, Opp, Weger, and Weiss.

The bachelor of science program in computer science is accredited by the Computing Accreditation Commission of ABET, <http://www.abet.org>.

To learn more about the department and the major then please check out the department webpage at <http://www.sdsmt.edu/MCS>.

Computer Science Curriculum

For the bachelor of science in Computer Science, a student must:

1. Take all of the courses listed in the Computer Science curriculum checklist;
2. Have a departmental grade point average of at least 2.00 in all CSC courses 300 level or higher.
3. All baccalaureate degrees must satisfy the general education requirements mandated by the Board of Regents. Please see the - General Education Requirements Checklist in this catalog.
4. Course requirements for the program also include the total number of credits per course. Any student that has an approved course for transfer will fulfill the course requirement, but if the transferred course does not meet the total credit hour requirement then the program committee will decide on the proper accommodation for meeting the total credit hour requirement. Students should consult with their advisor to get clarification on the necessary accommodation.

Computer Science Curriculum/Checklist

Students are responsible for checking with their advisors for any program modifications that may occur after the publication of this catalog.

Freshman Year

First Semester

- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1) ³
- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5) ³
- CSC 150/150L Computer Science I/Lab **Credits: (2-1) 3**
- Humanities or Social Sciences Elective(s) **Credits: 3** ^{1,3}
- CSC 110 Survey of Computer Science and Mathematics **Credits: (1-0) 1**

Total: 14

Second Semester

- MATH 125 Calculus II **Credits: (4-0) 4**
- Humanities or Social Sciences Elective(s) **Credits: 3** ^{1,3}
- CSC 250 Computer Science II **Credits: (4-0) 4**
- CSC 251 Finite Structures **Credits: 2 or 4** ²

Total: 15

Sophomore Year

First Semester

- CSC 300 Data Structures **Credits: (4-0) 4**
- MATH 225 Calculus III **Credits: (4-0) 4**
- CSC 314/314L Assembly Language/Lab **Credits: (2-1) 3**
- Humanities or Social Science Elective(s) **Credits: 3** ^{1,3}

Total: 14

Second Semester

- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1) ³
- CSC 484 Database Management Systems **Credits: (3-0) 3**
- MATH 315 Linear Algebra **Credits: (3-0) 3**
- Humanities or Social Sciences Elective(s) **Credits: 3** ^{1,3}
- Science Elective **Credits: 3** (Goal 6) ^{1,3}
- Science Elective Lab **Credits: 1** (Goal 6) ^{1,3}

Total: 16

Junior Year

First Semester

- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 2) ³
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3** (Goal 6) ³
- CSC 317 Computer Organization and Architecture **Credits: (3-0) 3**
- CSC 372 Analysis of Algorithms **Credits: (3-0) 3**
- Science Elective **Credits: 3** ¹
- Science Elective Lab **Credits: 1** ¹

Total: 15

Second Semester

- CSC 456/456L Operating Systems/Lab **Credits: (3-1) 4**
- CSC 470 Software Engineering **Credits: (3-0) 3**
- Elective or CSC Elective **Credits: 9** ¹

Total: 16

Senior Year

First Semester

- CSC 461 Programming Languages **Credits: (4-0) 4**
- CSC 464 Senior Design I **Credits: (2-0) 2**
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**
- Humanities or Social Sciences Elective(s) **Credits: 3** ^{1,3}
- Elective or CSC Elective **Credits: 3** ¹

Total: 15

Second Semester

- CSC 468/568 Graphical User Interface Programming **Credits: (3-0) 3**
- CSC 465 Senior Design II **Credits: (2-0) 2**
- Elective or CSC Elective **Credits: 6** ¹
- Elective or MATH Elective **Credits: 3** ¹

Total: 14

120 credits required for graduation

Curriculum Notes

- CSC 464/CSC 465 is a two-course sequence in senior design. It is expected that the course sequence will be taken in successive semesters.
- An exit exam, such as the Major Field Achievement Test in Computer Science, will be given as part of CSC 465. The overall results of this exam will be used to assess the computer science program.
- CHEM 106, CSC 105, MATH 021, MATH 101, MATH 102, MATH 120, PHYS 111, and PHYS 113 may not be counted towards the Computer Science degree.

¹ Elective courses must be chosen to satisfy all of the following requirements.

- Fifteen semester hours in humanities or social science. At least 6 hours must be in humanities and at least 6 hours must be in social sciences to fulfill Board of Regents General Education Requirements.
- A minimum of 4 computer science elective courses from the following list: CSC 410/510, CSC 412/512, CSC 414/514, CSC 415/415L/515/515L, CSC 416/516, CSC 426/526, CSC 433/533, CSC 441/541, CSC 442/542, CSC 445/545, CSC 447/547, CSC 449/549, CSC 454/554, CSC 476/476L/576/576L, and CENG 444/444L/544/544L. A 3-credit Co-op (CP 497) may be substituted for, at most, one computer science elective. Special topics and independent study courses may not be used to satisfy the computer science elective requirement;
- The eleven credit science requirement for this major consists of PHYS 211/211A and two more lecture courses from among BIOL 151, BIOL 153, CHEM 112, CHEM 114, GEOL 201, or PHYS 213/213-A; plus two labs that accompany the science courses taken, i.e., either BIOL 151L, BIOL 153L, CHEM 112L, CHEM 114L, GEOL 201L, or PHYS 213L. Students must complete science classes from at least two different disciplines.
- The math elective includes any course from the following list: MATH 321, MATH 382, MATH 413, MATH 421, MATH 423, or MATH 443/543 .

² CSC 251 must be taken for four credits to apply towards the Computer Science major.

³ Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements. Please see footnote "1" for specific Humanities/Social Science requirements for CSC majors.

Electrical Engineering, BS

ECE Contact Information

Magesh T. Rajan

ECE Department Head and Professor
Electrical Engineering/Physics 311
Phone: (605) 394-1219;
E-mail: Magesh.Rajan@sdsmt.edu

Thomas P Montoya

ECE Undergraduate Program Coordinator & Associate Professor
Electrical Engineering/Physics 325
Phone: (605) 394-2459;
Email: Thomas.Montoya@sdsmt.edu

Electrical Engineering Curriculum/Checklist

The bachelor of science program in electrical engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>, 415 North Charles Street, Baltimore, MD 21201; Phone +1.410.347.7700.

Students are responsible for checking with their advisors for any program modifications that may occur after the publication of this catalog.

Freshman Year

First Semester

- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5) ⁵
- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6) ⁵
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1** (Goal 6) ⁵
- CENG 244/244L Introduction to Digital Systems/Lab **Credits: (3-1) 4**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ⁵

Total: 15

Second Semester

- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1) ⁵
- MATH 125 Calculus II **Credits: (4-0) 4**
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3** (Goal 6) ⁵
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ⁶
- CSC 150/150L Computer Science I/Lab **Credits: (2-1) 3**

Total: 16

Sophomore Year

First Semester

- EE 220/220L Circuits I/Lab **Credits: (3-1) 4**
- MATH 321 Differential Equations **Credits: (3-0) 3**
- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1) ⁵
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**
- PHYS 213L University Physics II Laboratory **Credits: (0-1) 1**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ⁵

Total: 17

Second Semester

- EM 216 Statics and Dynamics **Credits: (4-0) 4**
- EE 221/221L Circuits II/Lab **Credits: (3-1) 4**
- MATH 225 Calculus III **Credits: (4-0) 4**
- EE 351/351L Mechatronics and Measurement Sys/Lab **Credits: (3-1) 4**
- EE 264L Electromechanical Systems Product Development and Design Lab **Credits: (0-2) 2**

Total: 18

Junior Year

First Semester

- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 2) ⁵
- EE 313 Signals and Systems **Credits: (3-0) 3**
- EE 320/320L Electronics I/Lab **Credits: (3-1) 4**
- EE 362 Electric and Magnetic Properties of Materials **Credits: (3-0) 3**
OR
- PHYS 439/539 Condensed Matter Physics **Credits: 3 to 4 credits**
- EE 381 Electric and Magnetic Fields **Credits: (3-0) 3**

Total: 16

Second Semester

- EE 314/314L Control Systems/Lab **Credits: (3-1) 4**
- EE 322/322L Electronics II/Lab **Credits: (3-1) 4**
- EE 330/330L Energy Systems/Lab **Credits: (3-1) 4**
- EE 382 Applied Electromagnetics **Credits: (3-0) 3**
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**

Total: 18

Senior Year

First Semester

- IENG 301 Basic Engineering Economics **Credits: (2-0) 2**
- EE 464 Senior Design Project I **Credits: (0-2) 2**
- EE Electrical Engineering Senior Elective(s) **Credits: 8**²
- Free Elective **Credits: 3**³

Total: 15

Second Semester

- EE 465 Senior Design Project II **Credits: (0-2) 2**
- EE Electrical Engineering Senior Elective **Credits: 3**²
- Technical Elective **Credits: 3**⁴
- General Education Goal 3 or 4 Elective(s) **Credits: 3**⁵

Choose 4 Credits From Either:

- CENG 447/447L/547/547L Embedded Systems **Credits: (3-1) 4**¹
OR
- ME 211 Introduction to Thermodynamics **Credits: (3-0) 3**¹
with Free Elective **Credits: 1**

Total: 15

130 credits required for graduation

Curriculum Notes

¹ Students must choose to take 4 credits from either CENG 447/447L/547/547L Credits: **(3-1) 4** or ME 211 Credits: **(3-0) 3** plus one credit free elective.

² Eleven electrical engineering senior elective credits required.

³ A free elective is any college level course 100 level or above that is acceptable toward an engineering or science degree. Military science courses, 100 level and above, apply as free electives only; substitution for departmental, technical, humanities, or social science electives is not permitted.

⁴ A technical elective is any science or engineering course 200 level or above that does not duplicate the content of any other course required for graduation. Co-op credits may be used for technical elective credit. A maximum of 6 co-op credits may be used for the EE degree.

⁵ Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

EE Senior Electives

Any regular CENG, CSC, or EE 4xx, dual-listed 5xx, or 6xx course may be used toward the EE senior electives requirement with the exceptions of CENG 464/CSC 464/EE 464, CENG 465/CSC 465/EE 465, CENG 447/447L/547/547L (if used in place of ME 211), and EE 505/505L. A maximum of four (4) co-op credits, CENG/CSC/EE 491/591/691, CENG/CSC/EE 492/592/692, and/or CENG/CSC/EE 498 may be used toward the EE senior electives requirement if a written request presented by the student is approved by the ECE faculty. The student request must justify that the EE design requirement is met. Additional courses approved toward the EE senior electives requirement are listed below.

- CSC 314/314L Assembly Language/Lab **Credits: (2-1) 3**
- CENG 342/342L Digital Systems/Lab **Credits: (3-1) 4**
- CSC 340 Software Engineering and Design **Credits: (3-0) 3**

Geological Engineering, BS

Contact Information

Dr. Laurie Anderson, Department Head

Department of Geology and Geological Engineering
Mineral Industries 303
(605) 394-2461
E-mail: Laurie.Anderson@sdsmt.edu

For more information on the geological engineering bachelor's degree see the Department of Geology and Geological Engineering page under Undergraduate Studies in this catalog. The bachelor of science program in geological engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>, 415 North Charles Street, Baltimore, MD 21201, Phone +1.410.347.7700.

Geological Engineering Curriculum/Checklist

It is the student's responsibility to check with his or her advisor for any program modifications that may occur after the publication of this catalog.

Freshman Year

First Semester

- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6) ⁴
- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5) ⁴
- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1) ⁴
- GEOE 110L Introduction to Geological and Mining Engineering/Lab **Credits: (0-1) 1**
- General Education Goal 3 or 4 Elective(s) **Credits: 6** ⁴

Total: 17

Second Semester

- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1** (Goal 6) ⁴
- CHEM 114 General Chemistry II **Credits: (3-0) 3** (Goal 6) ⁴
- MATH 125 Calculus II **Credits: (4-0) 4**
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3**
- GEOE 221/221L Geology for Engineers/Lab **Credits: (2-1) 3**
- CEE 117/117L Introduction to CADD/Lab **Credits: (1-1) 2**

Total: 16

Sophomore Year

First Semester

- EM 214 Statics **Credits: (3-0) 3**
- MATH 225 Calculus III **Credits: (4-0) 4**
- MEM 201L Surveying for Mineral Engineers **Credits: (0-2) 2**
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**
- General Education Goal 3 or 4 Elective(s) **Credits: 3**⁴

Total: 15

Second Semester

- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1)⁴
- EM 321 Mechanics of Materials **Credits: (3-0) 3**
- GEOL 212/212L Mineralogy and Crystallography/Lab **Credits: (2-1) 3**
- MATH 321 Differential Equations **Credits: (3-0) 3**
- General Education Goal 3 or 4 Electives **Credits: 3**⁴

Total: 15

Junior Year

First Semester

- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 2)⁴
- GEOL 331/331L Stratigraphy and Sedimentation/Lab **Credits: (2-1) 3**
- GEOL 341/341L Igneous and Metamorphic Petrology/Lab **Credits: (2-1) 3**
- CEE 346/346L Geotechnical Engineering/Lab **Credits: (2-1) 3**
- MET 320 Metallurgical Thermodynamics **Credits: (4-0) 4**

Total: 16

Second Semester

- GEOL 322/322L Structural Geology/Lab **Credits: (2-1) 3**
- GEOE 324/324L Engineering Geophysics I/Lab **Credits: (2-1) 3**¹
- EM 331 Fluid Mechanics **Credits: (3-0) 3**
- GEOL 416/416L/516/516L Introduction to GIS/Lab **Credits: (2-1) 3**
- MEM 302 Mineral Economics and Finance **Credits: (3-0) 3**

Total: 15

Summer

- GEOE 410 Engineering Field Geology **Credits: (6-0) 6**¹
(SD Mines students must take GEOE 410 for 6 credits.)

Total: 6

Senior Year

First Semester

- GEOE 466/466L/566/566L Engineering and Environmental Geology/Lab **Credits: (2-1) 3**¹
- GEOE 475/475L/575/575L Groundwater/Lab **Credits: (2-1) 3**¹
- GEOE 464 Geological Engineering Design Project I **Credits: (3-0) 3**¹
- Approved Elective(s) **Credits: 3**²
- Professional Elective(s) **Credits: 3**³

Total: 15

Second Semester

- MEM 304/304L Theoretical and Applied Rock Mechanics/Lab **Credits: (2-1) 3**
- Professional Elective(s) **Credits: 3**³
- GEOE 465 Geological Engineering Design Project II **Credits: (3-0) 3**¹
- GEOE 461/561 Petroleum Drilling and Production Engineering **Credits: (3-0) 3**¹
- Upper Level Humanities or Social Sciences Elective(s) **Credits: 3**

Total: 15

130 credits required for graduation

Curriculum Notes

Additional coursework in mathematics and statistics is encouraged. MATH 381 and MATH 382 are recommended statistics courses. MATH 432/532 is recommended for students interested in numerical modeling of partial differential equations.

¹ A grade of "C" or better is required in these courses for graduation with a Geological Engineering BS Degree.

Approved Electives (3 credits required):

² The purpose of the approved elective is to allow students to gain knowledge that will support their chosen area of expertise through a course that may or may not have significant engineering content. Commonly, students will enroll in a GEOE or GEOL course, co-op credits, or other advisor-approved courses to satisfy these three credits. All of the courses listed in the "Professional Elective" list below will also satisfy the approved elective requirement, but courses cannot be double-counted.

Professional Electives (6 credits required):

³ Professional elective courses must contain significant engineering content. The list below includes courses that satisfy the GEOE professional elective requirement. Students may take a course that is not on the list if it is approved by their advisor (including 600-level graduate courses).

***denotes courses whose prerequisite is also on this list and would be taken as a pair.**

Ψdenotes courses that have MEM 304/304L Theoretical and Applied Rock Mechanics/Lab as a prerequisite (typically taken during the spring semester of senior year).

- GEOE 412/512 Science and Engineering Field Applications **Credits: 3 to 6**
- GEOE 421/521 Aqueous Geochemistry **Credits: (3-0) 3**
- GEOE 425/425L/525/525L Engineering Geophysics II/Lab **Credits: (2-1) 3**
- GEOL 451/451L Economic Geology/Lab **Credits: (2-1) 3**
- GEOE 482/482L/582/582L Applied Geomorphology/Lab **Credits: (3-0) 3**
- CEE 325 Introduction to Sustainable Design **Credits: (3-0) 3**
- CEE 326 Environmental Engineering I **Credits: (3-0) 3**
- CEE 327/327L Environmental Engineering II/Lab **Credits: (2-1) 3 ***
- CEE 337 Engineering Hydrology **Credits: (3-0) 3**
- CEE 347 Geotechnical Engineering II **Credits: (3-0) 3**
- CEE 425/525 Sustainable Engineering **Credits: (3-0) 3**
- CEE 426/526 Environmental Engineering Unit Operations and Processes **Credits: (3-0) 3**
- CEE 427/527 Environmental Engineering Biological Process Design **Credits: (3-0) 3**
- CEE 428/528 Oil and Gas Development and the Environment **Credits: (3-0) 3**
- CEE 437/437L/537/537L Watershed and Floodplain Modeling/Lab **Credits: (2-1) 3 ***
- CEE 447/547 Foundation Engineering **Credits: (3-0) 3**
- CEE 448/548 Applied Geotechnical Engineering **Credits: (3-0) 3**
- MEM 305 Introduction to Explosives Engineering **Credits: (3-0) 3**
- MEM 307 Mineral Exploration and Geostatistics **Credits: (3-0) 3**
- MEM 405 Mine Permitting and Reclamation **Credits: (3-0) 3**
- MEM 420/520 Advanced Tunneling and Underground Excavation **Credits: (3-0) 3 Ψ**
- MEM 425/525 Advanced Rock Mechanics **Credits: (3-0) 3 Ψ**
- MEM 430/530 Resource Industry Mergers and Acquisitions **Credits: (3-0) 3**
- MEM 433/433L/533/533L Advanced Mine Planning & Design **Credits: (2-1) 3**
- MEM 435/535 Resource Industry Finance and Accounting **Credits: (3-0) 3**
- MEM 445/545 Advanced Geostatistics and Grade Estimations **Credits: (2-1) 3 ***
- MEM 450/550 Rock Slope Engineering **Credits: (3-0) 3 Ψ**
- MEM 480/580 Advanced Explosives and Blasting **Credits: (3-0) 3 ***

General Education Requirments (30 Credits)

⁴ Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

Geology, BS

Contact Information

Dr. Laurie Anderson, Department Head

Department of Geology and Geological Engineering

Mineral Industries 303

(605) 394-2461

E-mail: Laurie.Anderson@sdsmt.edu

Geology/Paleontology Curriculum/Checklist

It is the student's responsibility to check with his or her advisor for any program modifications that may occur after the publication of this catalog. When planning coursework, students are advised that the courses GEOL 212/212L, GEOL 341/341L, GEOL 322/322L and GEOL 410 form a critical sequence that must be taken in the order listed. Students may select program electives (those with a GEOL or GEOE prefix) and free electives (college credits approved by the student's academic advisor) in five focus areas including Energy and Mineral Resources, Environmental Geology, Geomathematics, Geospatial Technology, and Paleontology. For more information on the geology bachelor's degree see the Department of Geology and Geological Engineering page under Undergraduate Studies in this catalog.

Freshman Year

First Semester

- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6) ¹
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1** (Goal 6) ¹
- ENGL 101 Composition I **Credits: (3-0) 3**
- GEOL 201 Physical Geology **Credits: (3-0) 3** (Goal 6) ¹
- GEOL 201L Physical Geology Laboratory **Credits: (0-1) 1**
- GEOL 110 Explorations in Geology **Credits: (2-0) 2**

Total: 13

Note: Some students may need preparatory math in the first semester, such as MATH 102 or MATH 120.

Second Semester

- CHEM 114 General Chemistry II **Credits: (3-0) 3**
- CHEM 114L General Chemistry II Lab **Credits: (0-1) 1**
- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5) ¹
- General Education Goal 3 or 4 Electives **Credits: 6** ¹

Total: 14

Sophomore Year

First Semester

- MATH 125 Calculus II **Credits: (4-0) 4**
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3**
- GEOL 323 Search for Our Past **Credits: (3-0) 3**²
- General Education Goal 3 or 4 Elective(s) **Credits: 3**¹

One of: 2-3 Credits

- CSC 111/111L Introduction to Computer Programming/Lab **Credits: (2-0) 2**
- CSC 150/150L Computer Science I/Lab **Credits: (2-1) 3**
- CSC 170/170L Programming for Engineers and Scientists **Credits: (3-0) 3**

Total: 15-16

Second Semester

- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**
- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1)¹
- GEOL 212/212L Mineralogy and Crystallography/Lab **Credits: (2-1) 3**
- Gen Ed Goal 3 and Goal 4 Elective(s) **Credits: 3**¹

One of: 3-4 Credits

- MATH 225 Calculus III **Credits: (4-0) 4**³
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**³

Total: 16

Junior Year

First Semester

- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 1)¹
- GEOL 331/331L Stratigraphy and Sedimentation/Lab **Credits: (2-1) 3**²
- GEOL 341/341L Igneous and Metamorphic Petrology/Lab **Credits: (2-1) 3**²
- GEOL 416/416L/516/516L Introduction to GIS/Lab **Credits: (2-1) 3**²
- Program Elective(s) **Credits: 3**⁴

Total: 15

Second Semester

- GEOL 322/322L Structural Geology/Lab **Credits: (2-1) 3** ^{*2}
- GEOL 461/461L Invertebrate Paleontology/Lab **Credits: (2-1) 3** ^{*2}
- Program Elective(s) **Credits: 3** ⁴
- Free Elective(s) **Credits: 3** ⁵

One of: 3 Credits

- GEOE 324/324L Engineering Geophysics I/Lab **Credits: (2-1) 3** [#]
- GEOE 482/482L/582/582L Applied Geomorphology/Lab **Credits: (3-0) 3** ^{*#}

Total: 15

Summer

- GEOL 410 Field Geology **Credits: (6-0) 6** ²

Total: 6

Senior Year

First Semester

- GEOL 464 Senior Research I **Credits: (0-1) 1** ²
- Program Elective(s) **Credits: 6** ⁴
- Free Elective(s) **Credits: 3** ⁵
- Humanities/Social Science elective(s) **Credits: 3**

Total: 13

Second Semester

- GEOL 465 Senior Research II **Credits: (0-3) 3** ^{2,6}
- Program Elective(s) **Credits: 6** ⁴
- Free elective(s) **Credits: 3-5** ⁵

Total: 12-14

120 credits required for graduation

Curriculum Notes

* Course offered in alternate years.

Students must take at least one of these two courses (GEOE 324/324L, GEOE 482/482L/582/582L). If both are taken, the second may serve as a program elective.

¹ Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

² A grade of "C" or better is required in these courses for graduation with a Geology B.S.

³ Students should consult an advisor when choosing math courses.

⁴ Program electives must have a GEOL or GEOE prefix. At least 9 credits must be taken from 400-level courses. Substitutions must be approved by the department head.

⁵ Free electives are courses with any prefix that are approved by the academic advisor.

⁶ Under exceptional circumstances, a student may petition the department head to substitute program electives for GEOL 465.

Choosing Electives for Career Paths

Program electives (courses with a GEOL or GEOE prefix) and free electives (other courses approved by a student's academic advisor) can be chosen to focus in one of five career paths or from two or more career paths, depending on a student's interests.

Students are strongly encouraged to consult with their advisor in selecting a career path and electives.

Recommended Electives for Career Paths

Energy and Mineral Resources

Recommended electives for energy and mineral resource geology include:

Free Electives

- MEM 120 Introduction to Mining, Sustainable Development, and Safety **Credits: (3-0) 3**
- MEM 201L Surveying for Mineral Engineers **Credits: (0-2) 2**
- MEM 204 Surface Mining Methods and Unit Operations **Credits: (3-0) 3**
- MEM 301/301L Computer Applications in Mining/Lab **Credits: (1-1) 2**
- MEM 307 Mineral Exploration and Geostatistics **Credits: (3-0) 3**
- MET 220 Mineral Processing and Resource Recovery **Credits: (3-0) 3**
- POLS 407 Environmental Law & Policy **Credits: (3-0) 3**

Program electives

- GEOE 324/324L Engineering Geophysics I/Lab **Credits: (2-1) 3**
- GEOE 461/561 Petroleum Drilling and Production Engineering **Credits: (3-0) 3**
- GEOE 466/466L/566/566L Engineering and Environmental Geology/Lab **Credits: (2-1) 3**
- GEOL 351 Earth Resources and the Environment **Credits: (3-0) 3**
- GEOL 403/503 Regional Field Geology **Credits: (0-1) 1**
- GEOL 420/520 Introduction to Remote Sensing **Credits: (3-0) 3**

- GEOL 422/422L/522/522L Tectonics and Sedimentary Basin Analysis/Lab **Credits: (2-1) 3**
- GEOL 442/442L/542/542L Optical Petrology/Lab **Credits: (2-1) 3**
- GEOL 450 Fluid and Thermal Diffusion **Credits: (3-0) 3**
- GEOL 451/451L Economic Geology/Lab **Credits: (2-1) 3**
- GEOL 476/576 Petroleum Geology **Credits: (3-0) 3**

A minor in Petroleum Systems is also offered; consult the requirements in the catalog.

Environmental Geology

Recommended electives for environmental geology include:

Free electives

- AES 201 Introduction to Atmospheric Sciences **Credits: (3-0) 3**
- AES 403/503 Biogeochemistry **Credits: (3-0) 3**
- AES 406/506 Global Environmental Change **Credits: (3-0) 3**
- BIOL 311 Principles of Ecology **Credits: (3-0) 3**
- BIOL 331 Microbiology **Credits: (3-0) 3**
- POLS 407 Environmental Law & Policy **Credits: (3-0) 3**

Program electives

- GEOE 324/324L Engineering Geophysics I/Lab **Credits: (2-1) 3**
- GEOE 466/466L/566/566L Engineering and Environmental Geology/Lab **Credits: (2-1) 3**
- GEOE 475/475L/575/575L Groundwater/Lab **Credits: (2-1) 3**
- GEOE 482/482L/582/582L Applied Geomorphology/Lab **Credits: (3-0) 3**
- GEOL 351 Earth Resources and the Environment **Credits: (3-0) 3**
- GEOL 361 Oceanography I **Credits: (3-0) 3**
- GEOL 403/503 Regional Field Geology **Credits: (0-1) 1**
- GEOL 420/520 Introduction to Remote Sensing **Credits: (3-0) 3**

Geospatial Technology

Recommended electives for geospatial technology include:

Free electives

- CSC 250 Computer Science II **Credits: (4-0) 4**
- CEE 437/437L/537/537L Watershed and Floodplain Modeling/Lab **Credits: (2-1) 3**
- MEM 201L Surveying for Mineral Engineers **Credits: (0-2) 2**
- MEM 301/301L Computer Applications in Mining/Lab **Credits: (1-1) 2**

Program electives

- GEOE 482/482L/582/582L Applied Geomorphology/Lab **Credits: (3-0) 3**
- GEOL 417/517 Geospatial Databases **Credits: (3-0) 3**
- GEOL 419/519 Advanced Geospatial Analysis **Credits: (3-0) 3**
- GEOL 420/520 Introduction to Remote Sensing **Credits: (3-0) 3**
- GEOL 450 Fluid and Thermal Diffusion **Credits: (3-0) 3**

A minor and an undergraduate certificate in Geospatial Technology are also offered; consult the requirements in the catalog for further information. Students considering the geospatial minor should take GEOL 416/416L/516/516L Intro to GIS by their junior year.

Geomathematics

Recommended electives for geomathematics include:

Free Electives

- MATH 321 Differential Equations **Credits: (3-0) 3**
- MATH 315 Linear Algebra **Credits: (3-0) 3**
- MATH 353 Linear Optimization **Credits: (3-0) 3**
- MATH 382 Probability Theory and Statistics II **Credits: (3-0) 3**
- MATH 451/551 Math Modeling **Credits: (3-0) 3**

Program Electives

- GEOE 324/324L Engineering Geophysics I/Lab **Credits: (2-1) 3**
- GEOE 475/475L/575/575L Groundwater/Lab **Credits: (2-1) 3**
- GEOL 419/519 Advanced Geospatial Analysis **Credits: (3-0) 3**
- GEOL 450 Fluid and Thermal Diffusion **Credits: (3-0) 3**

Paleontology

Recommended electives for paleontology include:

Free electives

- AES 403/503 Biogeochemistry **Credits: (3-0) 3**
- AES 406/506 Global Environmental Change **Credits: (3-0) 3**
- BIOL 121 Basic Anatomy **Credits: (3-0) 3**
- BIOL 121L Basic Anatomy Lab **Credits: (0-1) 1**
- BIOL 151 General Biology I **Credits: (3-0) 3**
- BIOL 153 General Biology II **Credits: (3-0) 3**
- BIOL 311 Principles of Ecology **Credits: (3-0) 3**

Program electives

- GEOE 482/482L/582/582L Applied Geomorphology/Lab **Credits: (3-0) 3**
- GEOL 361 Oceanography I **Credits: (3-0) 3**
- GEOL 372 Dinosaurs **Credits: (3-0) 3**
- GEOL 403/503 Regional Field Geology **Credits: (0-1) 1**
- GEOL 471/571 Field Paleontology **Credits: (0-2) 2**
- GEOL 472/472L/572/572L Museum Collections Management/Lab **Credits: (2-1) 3**
- GEOL 473/473L/573/573L Museum Exhibit Design/Lab **Credits: (2-1) 3**
- GEOL 474/574 Paleontological Resource Management **Credits: (3-0) 3**
- GEOL 475/475L/575/575L Vertebrate Fossil Preparation and Conservation **Credits: (2-1) 3**

Industrial Engineering and Engineering Management, BS

Contact Information

Dr. Jeffrey C. Woldstad

Professor and Head

Department of Industrial Engineering

LIB 148

(605) 394-2628

E-mail: Jeffrey.Woldstad@sdsmt.edu

Faculty

Professors Kellogg, Kerk, and Woldstad; Associate Professors D. Jensen, Matejcik, and Piper; Assistant Professor Dubey; and Lecturer P. Jensen.

Accreditation

The bachelor of science program in industrial engineering and engineering management is accredited for industrial engineering and engineering management by the Engineering Accreditation Commission of ABET, <http://www.abet.org>, 415 North Charles Street, Baltimore, MD 21201; Phone +1.410.347.7700.

Industrial Engineering Curriculum/Checklist

Students are responsible for checking with their advisors for any program modifications that may occur after the publication of this catalog.

Freshman Year

First Semester

- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5) ²
- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6) ²
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ²
- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1) ²
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1** (Goal 6) ²
- IENG 248/248L Engineering Graphics and Computer Modeling **Credits: (1-1) 2**

Total: 16

Second Semester

- MATH 125 Calculus II **Credits: (4-0) 4**
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3** (Goal 5) ²
- PSYC 101 General Psychology **Credits: (3-0) 3** (Goal 3) ²
- IENG 241L Introduction to Quality Methods and Teaming **Credits: (0-2) 2**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ²

Total: 15

Sophomore Year

First Semester

- Engineering Fundamentals Elective **Credits: 3**
- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1) ²
- MATH 225 Calculus III **Credits: (4-0) 4**
- IENG 381 Introduction to Probability and Statistics **Credits: (3-0) 3**
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**
- PHYS 213L University Physics II Laboratory **Credits: (0-1) 1**

Total: 17

Second Semester

- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 2) ²
- MATH 321 Differential Equations **Credits: (3-0) 3**
- IENG 215 Cost Estimating for Engineers **Credits: (3-0) 3**
- IENG 382 Probability Theory and Statistics II **Credits: (3-0) 3**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ²
- Engineering Fundamentals Elective **Credits: 3**

Total: 18

Junior Year

First Semester

- IENG 311/311L Work Methods and Measurements/Lab **Credits: (2-1) 3**
- IENG 302 Engineering Economics **Credits: (3-0) 3**
- IENG 486 Statistical Quality and Process Control **Credits: (3-0) 3**
- IENG 352 Creativity and Innovation **Credits: (1-0) 1**
- IENG 354 Marketing Technology Innovations **Credits: (1-0) 1**
- IENG 362 Stochastic Models **Credits: (3-0) 3**
- Professional Breadth Elective **Credits: 3**

Total: 17

Second Semester

- IENG 355 Financing Technology Innovations **Credits: (1-0) 1**
- IENG 441 Simulation **Credits: (3-0) 3**
- ENGM 435/535 Optimization Techniques **Credits: (3-0) 3**
- IENG 321/321L Ergonomics/Human Factors Engineering/Lab **Credits: (2-1) 3**
- Engineering Fundamentals Elective **Credits: 3**
- Professional Breadth Elective **Credits: 4**

Total: 17

Senior Year

First Semester

- IENG 425 Production and Operation Management **Credits: (3-0) 3**
- IENG 331 Safety Engineering **Credits: (3-0) 3**¹
- IENG 471 Facilities Planning **Credits: (3-0) 3**
- IENG 464 Senior Design Project I **Credits: (1-2) 3**
- Professional Breadth Elective **Credits: 3**

Total: 15

Second Semester

- IENG 366 Engineering Management **Credits: (3-0) 3**
- IENG 465 Senior Design Project II **Credits: (0-3) 3**
- IENG 475/475L Computer-Controlled Manufacturing Systems and Robotics **Credits: (2-1) 3**
- Upper Division Humanities or Social Sciences Elective(s) **Credits: 3**
- Department Elective **Credits: 3**

Total: 15

130 credits required for graduation

Curriculum Notes

¹ IENG 431/531 (Industrial Hygiene) may be substituted during a second semester.

² Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

Students planning to apply for the accelerated master's degree should consult their advisor.

At least 3 hours of humanities or social science must be at the 300 or 400 level.

Department Electives (6 credits)

Human Engineering (3 credits)

- IENG 331 Safety Engineering **Credits: (3-0) 3**
- IENG 431/531 Industrial Hygiene **Credits: (3-0) 3**

Department Breadth (3 credits)

- IENG 353 Commercialization of New Technology **Credits: (1-0) 1**
- IENG 356 Technology Start Ups **Credits: (1-0) 1**
- IENG 451/451L Operational Strategies/Lab **Credits: (2-1) 3**
- IENG 452 Introduction to Six Sigma **Credits: (1-0) 1**
- IENG 466/566 Project Planning and Control **Credits: (3-0) 3**
- IENG 492/592 Topics **Credits: 1 to 3**

Engineering Fundamentals (9 credits)

Fundamentals (9 credits from at least two different areas)

Materials

- MET 231 Structures and Properties of Materials Lab **Credits: (0-1) 1**
- MET 232 Properties of Materials **Credits: (3-0) 3**

Circuits

- EE 301/301L Introduction to Circuits, Machines, and Systems/Lab **Credits: (3-1) 4 OR**
- EE 220/220L Circuits I/Lab **Credits: (3-1) 4**

Statics/Dynamics

- EM 214 Statics **Credits: (3-0) 3**
OR
- EM 216 Statics and Dynamics **Credits: (4-0) 4**
OR
- EM 214 Statics **Credits: 3 AND**
- EM 215 Dynamics **Credits: (3-0) 3**
OR
- EM 214 Statics **Credits: 3 AND**
- ME 221 Dynamics of Mechanisms **Credits: (3-0) 3**

Thermodynamics

- CBE 222 Chemical Engineering Process Thermodynamics **Credits: (3-0) 3**
OR
- MET 320 Metallurgical Thermodynamics **Credits: (4-0) 4**
OR
- ME 211 Introduction to Thermodynamics **Credits: (3-0) 3**

Fluid Mechanics

- EM 328 Applied Fluid Mechanics **Credits: (3-0) 3 OR**
- EM 331 Fluid Mechanics **Credits: (3-0) 3 OR**
- ME 331 Thermo Fluid Dynamics **Credits: (3-0) 3**

Mechanics

- ME 216 Introduction to Solid Mechanics **Credits: (3-0) 3 OR**
- EM 321 Mechanics of Materials **Credits: (3-0) 3**

Professional Breadth (10 credits)

- Courses in Department Electives beyond 6-credit requirement
- Courses in Engineering Fundamentals beyond 9 credit requirement

Engineering Breadth

- CENG 244/244L Introduction to Digital Systems/Lab **Credits: (3-1) 4**
- GEOE 221/221L Geology for Engineers/Lab **Credits: (2-1) 3**
- CP 297/397/497 Cooperative Education **Credits: 1 to 3**
- CSC 150/150L Computer Science I/Lab **Credits: (2-1) 3**
- CSC 250 Computer Science II **Credits: (4-0) 4**
- CBE 217 Chemical Engineering Material Balances **Credits: (3-0) 3 OR**
- CBE 317 Chemical Engineering Heat Transfer **Credits: (3-0) 3**
- CBE 318 Chemical Engineering Mass Transfer **Credits: (3-0) 3**

Mathematics and Science Breadth

- MATH 315 Linear Algebra **Credits: (3-0) 3**
- MATH 373 Introduction to Numerical Analysis **Credits: (3-0) 3**
- MATH 423 Advanced Calculus I **Credits: (4-0) 4**
- MATH 451/551 Math Modeling **Credits: (3-0) 3**
- MATH 447/547 Design of Experiments **Credits: (3-0) 3**
- GEOL 201 Physical Geology **Credits: (3-0) 3**
- BIOL 121 Basic Anatomy **Credits: (3-0) 3**
- BIOL 121L Basic Anatomy Lab **Credits: (0-1) 1**
- BIOL 151 General Biology I **Credits: (3-0) 3**
- BIOL 151L General Biology I Lab **Credits: (0-1) 1**
- BIOL 153 General Biology II **Credits: (3-0) 3**
- BIOL 153L General Biology II Lab **Credits: (0-1) 1**
- CHEM 114 General Chemistry II **Credits: (3-0) 3**
- CHEM 114L General Chemistry II Lab **Credits: (0-1) 1**
- CHEM 326 Organic Chemistry I **Credits: (3-0) 3**
- CHEM 326L Organic Chemistry I Lab **Credits: (0-2) 2**
- CHEM 328 Organic Chemistry II **Credits: (3-0) 3**
- CHEM 328L Organic Chemistry II Lab **Credits: (0-2) 2**

Organizational Management Breadth

- PSYC 331 Industrial and Organizational Psychology **Credits: (3-0) 3**
- ENGM courses other than ENGM 435/535
- ACCT 210
- ACCT 211
- BADM 350
- BADM 370
- BADM 407
- ECON 201
- ECON 202

Petitioned Courses

Students may petition the department to consider specific courses that are not on the approved list. Students must submit a formal petition in writing requesting that a specific course be considered for inclusion on the student's program of study. The petition must include the course prefix and number and specific, but concise, rationale as to how the course complements the student's professional development for a given career goal.

Interdisciplinary Sciences: Atmospheric Sciences Specialization, BS

Dr. Adam J. French

Atmospheric and Environmental Sciences Program
Mineral Industries Building 208
(605) 394-1649
E-mail: Adam.French@sdsmt.edu

Interdisciplinary Sciences B.S.

Interdisciplinary Sciences Program Admission Policy

After successful completion of at least 60 credit hours and at least one year prior to the intended graduation date, the student must apply for admission to the degree program by filing a plan of study with the IS curriculum committee. The plan of study must be approved by the curriculum committee before a student will be formally admitted to the program. This plan of study consists of (1) a Letter of Intent stating the career goals to which the IS degree coursework is to be applied and (2) an IS worksheet showing the courses already taken and the courses to be completed prior to graduation. The Letter of Intent and worksheet must be reviewed and approved by the student's IS advisor before submission to the curriculum committee. The Letter of Intent form and worksheet may be accessed on the IS website.

Deadline for submitting the Letter of Intent and worksheet to the IS office: For May graduates - April 30 of the preceding year; for August graduates - July 30 of preceding year; for December graduates - November 30 of preceding year. Students must have an approved Letter of Intent and IS worksheet on file in the IS office before registering for IS 498, the senior capstone project.

General Requirements for Graduation

For all interdisciplinary sciences specializations, students are responsible to check with their advisors for any program modifications that may occur after the publication of this catalog.

I. IS Core Courses (IS 201, IS 401, IS 498)	9 credits
II. English sequence (ENGL 101, ENGL 279, ENGL 289)	9 credits
III. Math, Computer Science, Sciences	
Math and Computer Sciences ¹	min. 12
Biology ²	min. 3
Chemistry ²	min. 3
Additional Natural Sciences ²	min. 24
Other Math, CSC, Sciences	min. 18

SUBTOTAL	60
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IV. Humanities and Social Sciences

Humanities general education	6
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Humanities upper division	6
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Social Sciences general education	6
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Social Science upper division	6
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SUBTOTAL	24
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V. Program Approved Electives ³	18
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120 credits required for graduation

Curriculum Notes

¹ All IS specializations require MATH 123 Calculus I or a math course requiring MATH 123 as its prerequisite. Some specializations require additional math courses beyond Math 123.

² All IS specializations require a minimum of 30 credit hours in the natural sciences, including 6 hours in sequence (e.g., BIOL 151/BIOL 153) and 12 hours at the upper division. Chemistry must be at the CHEM 112 level or higher. Biology must be at the BIOL 121 level or higher. Students are expected to identify a science concentration and are encouraged to pursue a science minor as appropriate to their specialization.

³ Engineering courses may be counted toward graduation as electives only.

Thirty-six of the required 120 credits must be at the junior or senior level (courses numbered 300 and above.)

Students must meet the Institutional Credit Requirements, which include completion of a minimum of 30 credits from the School of Mines. In addition, 15 of the last 30 credits counted towards the degree must be taken from School of Mines.

Interdisciplinary Sciences Core Courses

All IS students take a sequence of three core courses distributed over three years. These courses are sequential and cannot be taken concurrently. IS courses cannot be counted for humanities/social science credit.

- IS 201 Introduction to Science, Technology, and Society **Credits: (3-0) 3** in the sophomore year;
- IS 401 Writing and Research in the Interdisciplinary Sciences **Credits: (3-0) 3** in the first semester of the senior year; and
- IS 498 Undergraduate Research/Scholarship **Credits: (0-3) 3** (senior project) in the second semester of the senior year.

Specialization in Atmospheric Sciences: Curriculum/Course Checklist

Course sequences may vary by student entry year, math/science placements, availability of AES courses, and career objectives. Students should consult with an atmospheric and environmental sciences/interdisciplinary sciences advisor for a more personalized course of study based on career goals within the atmospheric and environmental sciences.

Required Courses for the Atmospheric Sciences Specialization Are:

- All courses and other curriculum requirements for the general IS degree requirement.
- The atmospheric sciences undergraduate series: AES 201, AES 401, AES 404, AES 406, AES 430, AES 450, AES 455, AES 460.
- The following mathematics and science courses (including required prerequisites): BIOL 311, CHEM 112, CHEM 112L, CHEM 114, CHEM 114L, CSC 150 or CSC 170, PHYS 211, PHYS 213, PHYS 213L, MATH 123, MATH 125, MATH 225, MATH 321.
- Sufficient professional development electives for a total of 120 academic credit hours.

Freshman Year

First Semester

- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6) ³
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1** (Goal 6) ³
- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1) ³
- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5) ³
- AES 201 Introduction to Atmospheric Sciences **Credits: (3-0) 3**

Total: 14

Second Semester

- CHEM 114 General Chemistry II **Credits: (3-0) 3** (Goal 5) ³
- CHEM 114L General Chemistry II Lab **Credits: (0-1) 1**
- CSC 150/150L Computer Science I/Lab **Credits: (2-1) 3**
OR
- CSC 170/170L Programming for Engineers and Scientists **Credits: (3-0) 3**
- MATH 125 Calculus II **Credits: (4-0) 4**
- General Education Goal 3 or 4 Elective(s) **Credits: 6** ³

Total: 17

Sophomore Year

First Semester

- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1) ³
- MATH 225 Calculus III **Credits: (4-0) 4**
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3**
- General Education Goal 3 or 4 Elective(s) **Credits: 6** ³

Total: 16

Second Semester

- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 2) ³
- IS 201 Introduction to Science, Technology, and Society **Credits: (3-0) 3**
- MATH 321 Differential Equations **Credits: (3-0) 3**
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**
- PHYS 213L University Physics II Laboratory **Credits: (0-1) 1**
- AES 404/504 Atmospheric Thermodynamics **Credits: 2 or 3** ¹

Total: 16

Junior Year

First Semester

- AES 450/450L Synoptic Meteorology I/Lab **Credits: (2-1) 3** ²
- AES 460/560 Atmospheric Dynamics **Credits: (3-0) 3** ²
- BIOL 311 Principles of Ecology **Credits: (3-0) 3**
- Upper Division HUM/SS Elective **Credits: 3**

Total: 12

Second Semester

- AES 406/506 Global Environmental Change **Credits: (3-0) 3**
- AES 430/530 Radar Meteorology **Credits: (3-0) 3** ²
- AES 455/455L/555/555L Synoptic Meteorology II/Lab **Credits: (2-1) 3** ²
- AES/SCI/MATH/ENG Electives **Credits: 3**
- Upper Division HUM/SS Elective **Credits: 3**

Total: 15

Senior Year

First Semester

- * AES 401/501 Atmospheric Physics **Credits: (3-0) 3**
- IS 401 Writing and Research in the Interdisciplinary Sciences **Credits: (3-0) 3**
- AES/SCI/MATH/ENG Electives **Credits: 6**
- Upper Division HUM/SS Elective **Credits: 3**

Total: 15

Second Semester

- AES/SCI/MATH/ENG Electives **Credits: 9**
- IS 498 Undergraduate Research/Scholarship **Credits: (0-3) 3**
- Upper Division HUM/SS Elective **Credits: 3**

Total: 15

120 credits required for graduation

Curriculum Notes

¹ Students in the IS-ATM specialization should take AES 404/504 for 3 credits.

² Courses offered alternate years.

³ Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

Recommended AES/SCI/MATH/ENG Electives (18 cr)

The following courses are recommended electives. Other science/math/engineering electives may be applied as approved by a student's advisor.

- AES 403/503 Biogeochemistry **Credits: (3-0) 3** ²
- AES 405/505 Air Quality **Credits: (3-0) 3** ²
- AES 419/519 High-Performance Computing in Earth Sciences **Credits: (3-0) 3** ²
- AES 570 The Wildfire Environment **Credits: (3-0) 3** ²
- BIOL 151 General Biology I **Credits: (3-0) 3**
- BIOL 151L General Biology I Lab **Credits: (0-1) 1**
- CP 297/397/497 Cooperative Education **Credits: 1 to 3**
- GEOL 416/416L/516/516L Introduction to GIS/Lab **Credits: (2-1) 3**
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**
- PHYS 225 Vibrations, Waves, and Optics **Credits: (3-0) 3**

HU/SS Electives (24 cr)

Students must complete a total of 24 credits of humanities and social sciences electives. This includes 6 credit hours from each discipline at the lower division (100/200 level), and 6 credit hours from each discipline at the upper division (300/400 level). Humanities electives include the ARTH, ENGL, HUM, PHIL, MUS, MUEN, SPAN prefixes, and HIST 121/122. Social Sciences electives include the ANTH, HIST, POLS, PSYC, and SOC prefixes. For each division, courses must come from different prefixes to fulfill the requirement. Lower division courses count toward Board of Regents general education requirements.

Interdisciplinary Sciences: Pre-Professional Health Sciences Specialization, BS

Contact Information

Dr. Allison B. Gilmore

Departments of Humanities and Social Sciences

Classroom Building 317

(605) 394-2481

E-mail: Allison.Gilmore@sdsmt.edu

Interdisciplinary Sciences B.S.

Interdisciplinary Sciences Program Admission Policy

After successful completion of at least 60 credit hours and at least one year prior to the intended graduation date, the student must apply for admission to the degree program by filing a plan of study with the IS curriculum committee. The plan of study must be approved by the curriculum committee before a student will be formally admitted to the program. This plan of study consists of (1) a Letter of Intent stating the career goals to which the IS degree coursework is to be applied and (2) an IS worksheet showing the courses already taken and the courses to be completed prior to graduation. The Letter of Intent and worksheet must be reviewed and approved by the student's IS advisor before submission to the curriculum committee. The Letter of Intent form and worksheet may be accessed on the IS website.

Deadline for submitting the Letter of Intent and worksheet to the IS office: For May graduates - April 30 of the preceding year; for August graduates - July 30 of preceding year; for December graduates - November 30 of preceding year. Students must have an approved Letter of Intent and IS worksheet on file in the IS office before registering for IS 498, the senior capstone project.

General Requirements for Graduation

For all interdisciplinary sciences specializations, students are responsible to check with their advisors for any program modifications that may occur after the publication of this catalog.

I. IS Core Courses (IS 201, IS 401, IS 498)	9 credits
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II. English sequence (ENGL 101, ENGL 279, ENGL 289)	9 credits
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III. Math, Computer Science, Sciences

Math and Computer Sciences ¹	min. 12
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Biology ²	min. 3
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Chemistry ²	min. 3
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Additional Natural Sciences ²	min. 24
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Other Math, CSC, Sciences	min. 18
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SUBTOTAL	60
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IV. Humanities and Social Sciences

Humanities general education	6
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Humanities upper division	6
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Social Sciences general education	6
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Social Science upper division	6
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SUBTOTAL	24
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V. Program Approved Electives ³	18
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120 credits required for graduation

Curriculum Notes

¹ All IS specializations require MATH 123 Calculus I or a math course requiring MATH 123 as its prerequisite. Some specializations require additional math courses beyond Math 123.

² All IS specializations require a minimum of 30 credit hours in the natural sciences, including 6 hours in sequence (e.g., BIOL 151/BIOL 153) and 12 hours at the upper division. Chemistry must be at the CHEM 112 level or higher. Biology must be at the BIOL 121 level or higher. Students are expected to identify a science concentration and are encouraged to pursue a science minor as appropriate to their specialization.

³ Engineering courses may be counted toward graduation as electives only.

Thirty-six of the required 120 credits must be at the junior or senior level (courses numbered 300 and above.)

Students must meet the Institutional Credit Requirements, which include completion of a minimum of 30 credits from the School of Mines. In addition, 15 of the last 30 credits counted towards the degree must be taken from School of Mines.

Interdisciplinary Sciences Core Courses

All IS students take a sequence of three core courses distributed over three years. These courses are sequential and cannot be taken concurrently. IS courses cannot be counted for humanities/social science credit.

- IS 201 Introduction to Science, Technology, and Society **Credits: (3-0) 3** in the sophomore year;
- IS 401 Writing and Research in the Interdisciplinary Sciences **Credits: (3-0) 3** in the first semester of the senior year; and
- IS 498 Undergraduate Research/Scholarship **Credits: (0-3) 3** (senior project) in the second semester of the senior year.

Pre-Professional Health Sciences (IS-HLTH): General Curriculum

Students should consult with their advisors for a more personalized course of study based on career goals within the health sciences. Course requirements may vary according to professional program, e.g., medical school, radiographic technology, physical therapy. Course sequence may also vary by student entry year, math/science placements, course availability, and career objectives.

Freshman Year

First Semester

- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1) ⁵
- BIOL 151 General Biology I **Credits: (3-0) 3** (Goal 6) ⁵
- BIOL 151L General Biology I Lab **Credits: (0-1) 1** (Goal 6) ⁵
- Math/CSC Elective **Credits: 4** (Goal 5) ^{1, 5}
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ^{2, 5}

Total: 14

Second Semester

- CHEM 112 General Chemistry I **Credits: (3-0) 3**
(Goal 6) ⁵
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1**
- BIOL 153 General Biology II **Credits: (3-0) 3**
- BIOL 153L General Biology II Lab **Credits: (0-1) 1**
- Math/CSC Elective **Credits: 3**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ⁵
- Program Approved Elective **Credits: 3** ⁴

Total: 17

Sophomore Year

First Semester

- CHEM 114 General Chemistry II **Credits: (3-0) 3**
- CHEM 114L General Chemistry II Lab **Credits: (0-1) 1**
- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1) ⁵
- IS 201 Introduction to Science, Technology, and Society **Credits: (3-0) 3**
- BIOL 221 Human Anatomy **Credits: (3-0) 3**
- BIOL 221L Human Anatomy Lab **Credits: (0-1) 1**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ⁵

Total: 17

Second Semester

- ENGL 289 Technical Communications II **Credits: (3-0) 3**
- Math/CSC Elective **Credits: 4**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ⁵
- BIOL 326 Biomedical Physiology **Credits: (3-0) 3**
- BIOL 326L Biomedical Physiology Lab **Credits: (0-1) 1**

Total: 14

Junior Year

First Semester

- Science Electives **Credits: 9** ³
- 300/400 HUM/SS Elective **Credits: 3**
- Math/CSC Elective **Credits: 3**

Total: 15

Second Semester

- Science Electives **Credits: 9**
- 300/400 HUM/SS elective **Credits: 3**
- Program Approved Electives **Credits: 3**

Total: 15

Senior Year

First Semester

- IS 401 Writing and Research in the Interdisciplinary Sciences **Credits: (3-0) 3**
- Science Electives **Credits: 4**
- Upper Division HUM/SS Elective **Credits: 3**
- Program Approved Elective **Credits: 4**

Total: 14

Second Semester

- IS 498 Undergraduate Research/Scholarship **Credits: (0-3) 3**
- 300/400 HUM/SS Elective **Credits: 3**
- Program Approved Electives **Credits: 8**

Total: 14

120 credits required for graduation

Curriculum Notes

Thirty-six (36) credits of the 120 credits required for graduation must be at a junior or senior level (courses numbered 300 or above).

¹ A minimum of twelve (12) semester hours of approved mathematics and computer sciences is required, including Math 123 or a math course requiring Math 123 as its prerequisite. Math 102 and Math 120 may be used towards graduation requirements for the IS-HLTH degree.

² A minimum of twenty-four (24) semester hours of university-approved humanities and social sciences is required. This minimum includes six (6) hours of general education coursework in Humanities, six (6) hours of general education coursework in Social Sciences, six (6) hours of upper division Humanities, and six (6) hours of upper division Social Sciences. Pre-health students are advised to take PSYC 101, SOC 100, and upper division psychology courses in preparation for professional school admission exams.

³ All IS specializations require a minimum of thirty (30) semester hours of natural sciences, including a minimum of three (3) semester hours in chemistry (Chem 112 or higher), three (3) semester hours in biology (Biol 121 or higher), and twelve (12) semester hours at the upper division. Of the thirty hours required in natural sciences, a minimum of six (6) credits must be sequential. The Professional Health Sciences specialization requires one year of general biology with labs, one year of general chemistry with labs, and one year of anatomy/physiology with labs. For information on specific requirements, IS majors are advised to consult their advisors and the worksheet for their career areas (e.g., pre-med, pre-PT, pre-PA) available from the IS website: www.sdsmt.edu/is.

⁴ Program-approved electives may include additional coursework in math, computer science, and the natural sciences. Students are expected to identify a science concentration and are encouraged to pursue a science minor (e.g., applied biological sciences or chemistry) as appropriate to their specialization. A total of 60 hours in math, computer science, and natural sciences is required. Elective credits may include additional college coursework at the 100 level or above in math, computer science, sciences, humanities, social sciences, business, military science, or engineering as needed to meet the required minimums or to qualify for a science minor.

⁵ Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

Interdisciplinary Sciences: Science, Technology, and Society Specialization, BS

Contact Information

Dr. Allison B. Gilmore

Departments of Humanities and Social Sciences

Classroom Building 317

(605) 394-2481

E-mail: Allison.Gilmore@sdsmt.edu

Interdisciplinary Sciences B.S.

Interdisciplinary Sciences Program Admission Policy

After successful completion of at least 60 credit hours and at least one year prior to the intended graduation date, the student must apply for admission to the degree program by filing a plan of study with the IS curriculum committee. The plan of study must be approved by the curriculum committee before a student will be formally admitted to the program. This plan of study consists of (1) a Letter of Intent stating the career goals to which the IS degree coursework is to be applied and (2) an IS worksheet showing the courses already taken and the courses to be completed prior to graduation. The Letter of Intent and worksheet must be reviewed and approved by the student's IS advisor before submission to the curriculum committee. The Letter of Intent form and worksheet may be accessed on the IS website.

Deadline for submitting the Letter of Intent and worksheet to the IS office: For May graduates - April 30 of the preceding year; for August graduates - July 30 of preceding year; for December graduates - November 30 of preceding year. Students must have an approved Letter of Intent and IS worksheet on file in the IS office before registering for IS 498, the senior capstone project.

General Requirements for Graduation

For all interdisciplinary sciences specializations, students are responsible to check with their advisors for any program modifications that may occur after the publication of this catalog.

I. IS Core Courses (IS 201, IS 401, IS 498)	9 credits
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II. English sequence (ENGL 101, ENGL 279, ENGL 289)	9 credits
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III. Math, Computer Science, Sciences	
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Math and Computer Sciences ¹	min. 12
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Biology ²	min. 3
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Chemistry ²	min. 3
------------------------	--------

Additional Natural Sciences ²	min. 24
Other Math, CSC, Sciences	min. 18
SUBTOTAL	60

IV. Humanities and Social Sciences

Humanities general education	6
Humanities upper division	6
Social Sciences general education	6
Social Science upper division	6
SUBTOTAL	24

V. Program Approved Electives ³	18
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120 credits required for graduation

Curriculum Notes

¹ All IS specializations require MATH 123 Calculus I or a math course requiring MATH 123 as its prerequisite. Some specializations require additional math courses beyond Math 123.

² All IS specializations require a minimum of 30 credit hours in the natural sciences, including 6 hours in sequence (e.g., BIOL 151/BIOL 153) and 12 hours at the upper division. Chemistry must be at the CHEM 112 level or higher. Biology must be at the BIOL 121 level or higher. Students are expected to identify a science concentration and are encouraged to pursue a science minor as appropriate to their specialization.

³ Engineering courses may be counted toward graduation as electives only.

Thirty-six of the required 120 credits must be at the junior or senior level (courses numbered 300 and above.)

Students must meet the Institutional Credit Requirements, which include completion of a minimum of 30 credits from the School of Mines. In addition, 15 of the last 30 credits counted towards the degree must be taken from School of Mines.

Interdisciplinary Sciences Core Courses

All IS students take a sequence of three core courses distributed over three years. These courses are sequential and cannot be taken concurrently. IS courses cannot be counted for humanities/social science credit.

- IS 201 Introduction to Science, Technology, and Society **Credits: (3-0) 3** in the sophomore year;
- IS 401 Writing and Research in the Interdisciplinary Sciences **Credits: (3-0) 3** in the first semester of the senior year; and
- IS 498 Undergraduate Research/Scholarship **Credits: (0-3) 3** (senior project) in the second semester of the senior year.

Science, Technology, and Society (STS): General Curriculum

Freshman Year

First Semester

- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1) ⁵
- Math/CSC Elective **Credits: 4** (Goal 5) ^{1,5}
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ^{2,5}
- BIOL 151 General Biology I **Credits: (3-0) 3** (Goal 6) ⁵
- BIOL 151L General Biology I Lab **Credits: (0-1) 1** (Goal 6) ⁵

Total: 14

Second Semester

- Math/CSC Elective **Credits: 3**
- Science Electives **Credits: 4** ³
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ⁵
- Program Approved Elective **Credits: 3** ⁴
- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6) ⁵
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1**

Total: 17

Sophomore Year

First Semester

- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1) ⁵
- IS 201 Introduction to Science, Technology, and Society **Credits: (3-0) 3**
- Science Elective **Credits: 8**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ⁵

Total: 17

Second Semester

- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 2) ⁵
- Math/CSC Elective **Credits 4**
- Science Elective **Credits: 4**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ⁵

Total: 14

Junior Year

First Semester

- Math/CSC Elective **Credits: 3**
- 300/400 Science Electives **Credits: 4**
- 300/400 HUM/SS Elective **Credits: 3**
- Program Approved Elective **Credits: 4**

Total: 14

Second Semester

- 300/400 Science Elective **Credits: 4**
- Science Electives **Credits: 3**
- 300/400 HUM/SS elective **Credits: 3**
- Program Approved Elective **Credits: 4**

Total: 14

Senior Year

First Semester

- IS 401 Writing and Research in the Interdisciplinary Sciences **Credits: (3-0) 3**
- Science Electives **Credits: 3**
- 300/400 HUM/SS Elective **Credits: 3**
- 300/400 Program Approved Elective **Credits: 3**
- 300/400 Science Elective **Credits: 4**

Total: 16

Second Semester

- IS 498 Undergraduate Research/Scholarship **Credits: (0-3) 3**
- Science Electives **Credits: 4**
- 300/400 HUM/SS Elective **Credits: 3**
- Program Approved Elective **Credits: 4**

Total: 14

120 credits required for graduation

Curriculum Notes

Thirty-six (36) credits of the 120 credits required for graduation must be at a junior or senior level (courses numbered 300 or above).

¹A minimum of twelve (12) semester hours of university-approved mathematics and computer sciences is required, including Math 123 or a math course requiring Math 123 as its prerequisite. Math 102 and Math 120 may be used towards graduation requirements for the IS-STS degree.

² A minimum of twenty-four (24) semester hours of university-approved humanities and social sciences is required. This minimum includes six (6) hours of general education coursework in Humanities, six (6) hours of general education coursework in Social Sciences, six (6) hours of upper division Humanities, and six (6) hours of upper division Social Sciences.

³ All IS specializations require a minimum of 30 semester hours of natural sciences including a minimum of three (3) semester hours in chemistry at the CHEM 112 level or higher, three (3) semester hours in biology at the BIOL 121 level or higher, and twelve (12) semester hours at the upper division level. Of the thirty hours required in natural sciences, a minimum of six (6) credits must be sequential. Students pursuing the Science, Technology, and Society specialization are encouraged to select a minor in a science field (e.g., atmospheric science, biology, computer science, environmental science, geology, geospatial technology, mathematics, physics). A total of 60 hours in math, computer sciences, and natural sciences is required. Students should consult with their advisors to determine the most appropriate science courses and sequence for their minors and for their career paths. The worksheet for the IS-STS specialization is available from the IS website: www.sdsmt.edu/is.

⁴ Program Approved elective credits may include additional college coursework at the 100 level or above in math, computer science, sciences, humanities, social sciences, business, military science, or engineering.

⁵ Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

Recommended Courses for Science, Technology, and Society Majors

Natural Sciences:

- AES 201 Introduction to Atmospheric Sciences **Credits: (3-0) 3**
- AES 403/503 Biogeochemistry **Credits: (3-0) 3**
- AES 405/505 Air Quality **Credits: (3-0) 3**
- BIOL 331 Microbiology **Credits: (3-0) 3**
- BIOL 333/333L Aquatic Ecology & Watershed Management **Credits: (4-0) 4**
- BIOL 375 Current Bioethical Issues **Credits: (3-0) 3**
- BIOL 383 Bioethics **Credits: (3-0) 3**
- BIOL 406/506 Global Environmental Change **Credits: (3-0) 3**
- BIOL 497 Cooperative Education **Credits: 1 to 12**
- CHEM 482/582 Environmental Chemistry **Credits: (3-0) 3**
- GEOL 201 Physical Geology **Credits: (3-0) 3**
- GEOL 323 Search for Our Past **Credits: (3-0) 3**
- GEOL 351 Earth Resources and the Environment **Credits: (3-0) 3**
- GEOL 361 Oceanography I **Credits: (3-0) 3**
- GEOL 372 Dinosaurs **Credits: (3-0) 3**

Humanities and Social Sciences

- HUM 100 Introduction to Humanities **Credits: (3-0) 3**
- HUM 200 Connections: Humanities & Technology **Credits: (3-0) 3**
- HUM 375 Computers in Society **Credits: (3-0) 3**
- ENGL 250 Science Fiction **Credits: (3-0) 3**
- ENGL 300 The Literary Experience of Nature **Credits: (3-0) 3**
- HIST 492 Topics **Credits: 1 to 4**
- PHIL 220 Introduction to Ethics **Credits: (3-0) 3**
- POLS 407 Environmental Law & Policy **Credits: (3-0) 3**
- PSYC 451 Psychology of Abnormal Behavior **Credits: (3-0) 3**
- PSYC 461 Theories of Personality **Credits: (3-0) 3**
- SOC 351 Criminology **Credits: (3-0) 3**
- SOC 411 Licit and Illicit Drugs **Credits: (3-0) 3**

Electives

- CBE 485/585 Renewable and Sustainable Energy **Credits: (3-0) 3**
- CEE 325 Introduction to Sustainable Design **Credits: (3-0) 3**
- CEE 425/525 Sustainable Engineering **Credits: (3-0) 3**
- CEE 428/528 Oil and Gas Development and the Environment **Credits: (3-0) 3**
- GEOE 475/475L/575/575L Groundwater/Lab **Credits: (2-1) 3**
- GEOL 412/512 Science and Engineering Field Applications **Credits: 3 to 6**
- GEOL 472/472L/572/572L Museum Collections Management/Lab **Credits: (2-1) 3**

Mechanical Engineering, BS

Contact Information

Dr. Pierre Larochelle

Department of Mechanical Engineering
Civil Mechanical Building Room #129
(605) 394-2401
E-mail: Pierre.Larochelle@sdsmt.edu

Web: <http://www.sdsmt.edu/me>

Faculty

Professors Abata, Larochelle, and Muci-Kuchler; Associate Professors Ash, Degen, Shahbazi, and Widener; Assistant Professors Bruno, Diwakar, Fekrmandi, Lessani, and Romkes; Lecturers Lalley and Rederth; and Instructor Knudson. Professors Emeritus Buck, Chiang, Dolan, Gnirk, Kalanovic, Kjerengtroen, Krause, Langerman, and Pendleton.

Staff

Senior Secretary Moore, Laboratory Coordinator Lalley, Fabrication Education Specialist Kuenkel, and Laboratory Technician Schilling.

Accreditation

The Bachelor of Science degree program in mechanical engineering at SDSM&T is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>. Information on program objectives and student learning outcomes can be found on our Accreditation and Assessment webpage.

Mechanical Engineering Curriculum/Checklist

Students are responsible for checking with their advisors for any program modifications that may occur after the publication of this catalog¹. To progress in the mechanical engineering curriculum students must attain a grade of C or better in select core courses (as noted below with an *).

Freshman Year

First Semester

- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5) ^{1, 2}
- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6) ²
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1** (Goal 6) ²
- ME 110/110L Introduction to Mechanical Engineering/Lab **Credits: (2-0) 2**
- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1) ²
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ²

Total: 16

Second Semester

- MATH 125 Calculus II **Credits: (4-0) 4** ¹
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3** (Goal 6) ²
- CSC 170/170L Programming for Engineers and Scientists **Credits: (3-0) 3**
- General Education Goal 3 or 4 Elective(s) **Credits: 6** ²
- ME 126L Design for Manufacturing **Credits: (0-2) 2**

Total: 18

Sophomore Year

First Semester

- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1) ²
- ME 210 Statics of Mechanisms **Credits: (3-0) 3** ¹
- MATH 225 Calculus III **Credits: (4-0) 4**
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**
- PHYS 213L University Physics II Laboratory **Credits: (0-1) 1**
- **Choose 4 credits to be completed from 1 of the 3 options listed below:**
 - Option #1
 - ME 264 Electromechanical Systems Product Development and Design **Credits: (2-0) 2**
 - ME 264L Electromechanical Systems Product Development and Design Lab **Credits: (0-2) 2**
 - OR**
 - Option #2
 - ME 265/265L Product Design and Development- Introduction to Systems Engineering/Lab **Credits: (2-2) 4**
 - OR**
 - Option #3
 - ME 269/269L Energy Systems Product Development and Design/Lab **Credits: (2-2) 4**

Total: 18

Second Semester

- ME 221 Dynamics of Mechanisms **Credits: (3-0) 3**¹
- ME 211 Introduction to Thermodynamics **Credits: (3-0) 3**¹
- MATH 321 Differential Equations **Credits: (3-0) 3**
- ME 216 Introduction to Solid Mechanics **Credits: (3-0) 3**¹
- MET 231 Structures and Properties of Materials Lab **Credits: (0-1) 1**
- MET 232 Properties of Materials **Credits: (3-0) 3**

Total: 16

Junior Year

First Semester

- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 2)²
- ME 316 Solid Mechanics **Credits: (3-0) 3**
- EE 301/301L Introduction to Circuits, Machines, and Systems/Lab **Credits: (3-1) 4**
- ME 331 Thermo Fluid Dynamics **Credits: (3-0) 3**
- MATH 373 Introduction to Numerical Analysis **Credits: (3-0) 3**

Total: 16

Second Semester

- ME 312 Thermodynamics II **Credits: (3-0) 3**
- ME 313 Heat Transfer **Credits: (3-0) 3**
- ME 352 Introduction to Dynamic Systems **Credits: (3-0) 3**
- ME 322 Machine Design I **Credits: (3-0) 3**
- ME 351/351L Mechatronics and Measurement Systems/Lab **Credits: (3-1) 4**

Total: 16

Senior Year

First Semester

- ME 477 Mechanical Engineering Design I **Credits: (0-2) 2**
- ME 481L Advanced Production Development Lab I **Credits: (0-1) 1**
- IENG 301 Basic Engineering Economics **Credits: (2-0) 2**
- ME 4XX Mechanical Engr Elective #1 **Credits: 4**
- General Education Goal 3 or 4 Elective(s) **Credits: 3**²
- ME 4XX Mechanical Engr Elective # 2 **Credits: 3**

Total: 15

Second Semester

- ME 479 Mechanical Systems Design II **Credits: (0-2) 2**
- ME 482L Advanced Product Development Lab II **Credits: (0-1) 1**
- ME 4XX Mechanical Engr Elective #3 **Credits: 3**
- ME 4XX Mechanical Engr Elective #4 **Credits: 3**
- Humanities or Social Sciences Elective(s) **Credits: 3**
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**

Total: 15

130 credits required for graduation

Curriculum Notes

Many courses are prerequisites for other courses and their sequencing is important. Consult with your faculty advisor whenever there is a deviation from the above schedule.

¹ A minimum grade of C is required in this course as a prerequisite for 1 or more subsequent required courses.

² Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

Metallurgical Engineering, BS

Contact Information

Department Head

Dr. Michael K. West
Department of Materials and Metallurgical Engineering
Mineral Industries 108
(605) 394-1283
E-mail: Michael.West@sdsmt.edu

Department Main Office

Administrative Assistant
Jessica Zacher, Senior Secretary
Department of Materials and Metallurgical Engineering
Mineral Industries 115
(605) 394-2341
Email: Jessica.Zacher@sdsmt.edu

Faculty

Douglas W. Fuerstenau Professor Kellar; Professors Cross and Salem; Associate Professors Crawford, West, and Widener; Assistant Professors Jasthi and Safarzadeh; Research Scientist Meruga; Adjunct Professors Bendler, Kustas, and Medlin; Distinguished Professor Emeritus Han; Professor Emeriti Howard and Stone.

Metallurgical Engineering Curriculum/Checklist

The following curriculum shows the path and requirements for a B.S. Degree in Metallurgical Engineering. Students should consult with their Metallurgical Engineering academic advisors for a more personalized course of study based on their academic preparedness and career goals. The curriculum includes coursework in the three core areas of metallurgical engineering 1) mineral processing and extractive metallurgy, 2) primary metallurgy and processing, and 3) physical and mechanical metallurgy. The curriculum also includes science electives and metallurgical directed electives to broaden student knowledge related to their area of interest and specialization. It is important to note that certain courses have prerequisite or corequisite requirements Students should consult with their academic advisor for any program modifications that may occur after the publication of this catalog.

Freshman Year

First Semester

- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5) ¹
- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6) ¹
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1** (Goal 6) ¹
- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1) ¹
- General Education Goal 3 or 4 Elective(s) **Credits: 6** ¹

Total: 17

Second Semester

- MATH 125 Calculus II **Credits: (4-0) 4**
- CHEM 114 General Chemistry II **Credits: (3-0) 3** (Goal 6) ¹
- CHEM 114L General Chemistry II Lab **Credits: (0-1) 1**
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3**
- CSC 170/170L Programming for Engineers and Scientists **Credits: (3-0) 3**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ¹

Total: 17

Sophomore Year

First Semester

- MET 232 Properties of Materials **Credits: (3-0) 3** *
- MET 231 Structures and Properties of Materials Lab **Credits: (0-1) 1**
- MATH 321 Differential Equations **Credits: (3-0) 3**
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**
- Science Elective **Credits: 3** ²
- EM 214 Statics **Credits: (3-0) 3**

Total: 17

Second Semester

- MATH 225 Calculus III **Credits: (4-0) 4**
- EM 321 Mechanics of Materials **Credits: (3-0) 3**
OR
- ME 216 Introduction to Solid Mechanics **Credits: (3-0) 3**
- MET 220 Mineral Processing and Resource Recovery **Credits: (3-0) 3** **
- MET 220L Mineral Processing and Resource Recovery Laboratory **Credits: (0-1) 1**
- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1) ¹
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ¹

Total: 17

Junior Year

The courses on the checklist correspond with the first semester of junior year beginning in an EVEN-numbered year. Course offering cycle information for Sets A, B, C, and D are provided in below.

First Semester

- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 2) ¹
- MET 320 Metallurgical Thermodynamics **Credits: (4-0) 4**
- Free Elective **Credits: 1**

Set A- Fall Even Years or Set C- Fall Odd Years

- MET 422 Transport Phenomena **Credits: (4-0) 4**
- Directed MET Elective **Credits: 3** ³

Total: 15

Second Semester

- MET 352/352L Principles of Metallurgical Design **Credits: (2-0) 2**
- MATH 373 Introduction to Numerical Analysis **Credits: (3-0) 3**
- Directed MET Elective **Credits: 3** ³

Set B- Spring Odd Years or Set D- Spring Even Years

- MET 321/321L High Temperature Extraction, Concentration, and Recycling/Lab **Credits: (3-1) 4**
- EE 301/301L Introduction to Circuits, Machines, and Systems/Lab **Credits: (3-1) 4**

Total: 16

Senior Year

The courses on the checklist correspond with the first semester of senior year beginning in an ODD-numbered year. Course offering cycle information for Sets A, B, C, and D are provided in below.

First Semester

- MET 464 Senior Design I **Credits: (0-2) 2**
- IENG 301 Basic Engineering Economics **Credits: (2-0) 2**
- Free Elective **Credits: 3**
- Upper Level (300/400) Humanities or Social Sciences Elective(s) **Credits: 3** ⁴

Set A- Fall Even Years or Set C- Fall Odd Years

- MET 330 Physics of Metals **Credits: (3-0) 3**
- MET 330L Physics of Metals Lab **Credits: (0-1) 1**
- MET 332 Thermomechanical Processing **Credits: (3-0) 3**

Total: 17

Second Semester

- MET 433 Process Control **Credits: (3-0) 3**
- MET 465 Senior Design II **Credits: (0-1) 1**
- Science Elective **Credits: 3**²

Set B- Spring Odd Years or Set D- Spring Even Years

- MET 440/540 Mechanical Metallurgy **Credits: (3-0) 3**
- MET 440L/540L Mechanical Metallurgy Lab **Credits: (0-1) 1**
- MET 310 Aqueous Extraction, Concentration, and Recycling **Credits: (3-0) 3**
- MET 310L Aqueous Extraction, Concentration, and Recycling Lab **Credits: (0-1) 1**

Total: 15

Set A-Fall Even Years

- MET 422 Transport Phenomena **Credits: (4-0) 4**
- Directed MET Elective **Credits: 3**³

Set B-Spring Odd Years

- MET 321/321L High Temperature Extraction, Concentration, and Recycling/Lab **Credits: (3-1) 4**
- EE 301/301L Introduction to Circuits, Machines, and Systems/Lab **Credits: (3-1) 4**

Set C-Fall Odd Years

- MET 330 Physics of Metals **Credits: (3-0) 3**
- MET 330L Physics of Metals Lab **Credits: (0-1) 1**
- MET 332 Thermomechanical Processing **Credits: (3-0) 3**

Set D-Spring Even Years

- MET 440/540 Mechanical Metallurgy **Credits: (3-0) 3**
- MET 440L/540L Mechanical Metallurgy Lab **Credits: (0-1) 1**
- MET 310 Aqueous Extraction, Concentration, and Recycling **Credits: (3-0) 3**
- MET 310L Aqueous Extraction, Concentration, and Recycling Lab **Credits: (0-1) 1**

130 credits required for graduation

Curriculum Notes

* A Minimum Grade of "C" Required to Proceed

** A Minimum Grade of "C" Required for Graduation

¹ Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

² See below for Department approved Science Electives, and also consult with your academic advisor as new electives may be added.

³ See below for approved Directed MET Electives, and also consult with your academic advisor as new electives may be added.

⁴ Three credits of upper level (300/400) Humanities or Social Sciences are required for graduation.

Directed MET Electives

- MET 426/526 Steelmaking **Credits: (3-0) 3**
- MET 430/430L Welding Engineering and Design of Welded Structures/Lab **Credits: (2-1) 3**
- MET 432/532 Advanced Materials and Processes **Credits: (3-0) 3**
- MET 444/544 Security Printing Technology **Credits: (3-0) 3**
- MET 445/545 Oxidation and Corrosion of Metals **Credits: (3-0) 3**
- MET 450/550 Forensic Engineering **Credits: (3-0) 3**
- MET 489/589 Composites Manufacturing **Credits: (1-0) 1**
- MES 475/575 Advances in Processing and Nanoengineering of Polymers **Credits: (2-0) 2**

Department Approved Science Electives

- AES 201 Introduction to Atmospheric Sciences **Credits: (3-0) 3**
- AES 401/501 Atmospheric Physics **Credits: (3-0) 3**
- AES 403/503 Biogeochemistry **Credits: (3-0) 3**
- AES 404/504 Atmospheric Thermodynamics **Credits: 2 or 3**
- AES 405/505 Air Quality **Credits: (3-0) 3**
- AES 406/506 Global Environmental Change **Credits: (3-0) 3**
- AES 460/560 Atmospheric Dynamics **Credits: (3-0) 3**
- BIOL 121 Basic Anatomy **Credits: (3-0) 3**
- BIOL 121L Basic Anatomy Lab **Credits: (0-1) 1**
- BIOL 151 General Biology I **Credits: (3-0) 3**
- BIOL 151L General Biology I Lab **Credits: (0-1) 1**
- BIOL 153 General Biology II **Credits: (3-0) 3**
- BIOL 153L General Biology II Lab **Credits: (0-1) 1**
- BIOL 221 Human Anatomy **Credits: (3-0) 3**
- BIOL 221L Human Anatomy Lab **Credits: (0-1) 1**
- BIOL 311 Principles of Ecology **Credits: (3-0) 3**
- BIOL 311L Principles of Ecology Laboratory **Credits: (0-1) 1**

- BIOL 326 Biomedical Physiology **Credits: (3-0) 3**
- BIOL 326L Biomedical Physiology Lab **Credits: (0-1) 1**
- BIOL 331 Microbiology **Credits: (3-0) 3**
- BIOL 331L Microbiology Lab **Credits: (0-1) 1**
- BIOL 341 Microbial Processes in Engineering and Natural Sciences **Credits: (3-0) 3**
- BIOL 341L Microbial Processes Laboratory **Credits: (0-1) 1**
- BIOL 371 Genetics **Credits: (3-0) 3**
- BIOL 371L Genetics Lab **Credits: (0-1) 1**
- BIOL 406/506 Global Environmental Change **Credits: (3-0) 3**
- BIOL 423 Pathogenesis **Credits: (3-0) 3**
- BIOL 423L Pathogenesis Lab **Credits: (0-1) 1**
- CHEM 316 Fundamentals of Organic Chemistry **Credits: (3-0) 3**
- CHEM 326 Organic Chemistry I **Credits: (3-0) 3**
- CHEM 328 Organic Chemistry II **Credits: (3-0) 3**
- CHEM 332 Analytical Chemistry **Credits: 2 or 3**
- CHEM 342 Physical Chemistry I **Credits: 2 to 3**
- CHEM 344 Physical Chemistry II **Credits: 2 to 3**
- CHEM 352 Systematic Inorganic Chemistry **Credits: (3-0) 3**
- CHEM 420/520 Organic Chemistry III **Credits: (3-0) 3**
- CHEM 421/521 Spectroscopic Analysis **Credits: (3-0) 3**
- CHEM 464/564 Biochemistry I **Credits: (3-0) 3**
- CHEM 465/565 Biochemistry II **Credits: (3-0) 3**
- CHEM 482/582 Environmental Chemistry **Credits: (3-0) 3**
- GEOL 201 Physical Geology **Credits: (3-0) 3**
- GEOL 212/212L Mineralogy and Crystallography/Lab **Credits: (2-1) 3**
- GEOL 331/331L Stratigraphy and Sedimentation/Lab **Credits: (2-1) 3**
- GEOL 351 Earth Resources and the Environment **Credits: (3-0) 3**
- GEOL 420/520 Introduction to Remote Sensing **Credits: (3-0) 3**
- NANO 401 Introduction to Nanoscience **Credits: (3-0) 3**
- NANO 445/545 Introduction to Nanomaterials **Credits: (3-0) 3**
- PHYS 331 Introduction to Modern Physics **Credits: (3-0) 3**
- PHYS 341 Thermodynamics **Credits: (2-0) 2**
- PHYS 343 Statistical Physics **Credits: (2-0) 2**
- PHYS 361 Optics **Credits: (3-0) 3**
- PHYS 404/504 Nanophotonics **Credits: (3-0) 3**
- PHYS 421/521 Electromagnetism **Credits: (4-0) 4**
- PHYS 433/533 Nuclear and Elementary Particle Physics **Credits: (3-0) 3**
- PHYS 439/539 Condensed Matter Physics **Credits: 3 to 4 credits**
- PHYS 445/545 Statistical Mechanics **Credits: (4-0) 4**
- PHYS 451/551 Classical Mechanics **Credits: (4-0) 4**
- PHYS 471/571 Quantum Mechanics **Credits: (4-0) 4**
- PHYS 481/581 Mathematical Physics **Credits: 3 to 4 credits**
- MATH 221 Introduction to Discrete Mathematics **Credits: (2-0) 2**
- MATH 281 Introduction to Statistics **Credits: (3-0) 3**
- MATH 315 Linear Algebra **Credits: (3-0) 3**
- MATH 353 Linear Optimization **Credits: (3-0) 3**
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**

- MATH 382 Probability Theory and Statistics II **Credits: (3-0) 3**
- MATH 413 Abstract Algebra I **Credits: (3-0) 3**
- MATH 421 Complex Analysis **Credits: (3-0) 3**
- MATH 423 Advanced Calculus I **Credits: (4-0) 4**
- MATH 424 Advanced Calculus II **Credits: (4-0) 4**
- MATH 432/532 Partial Differential Equations **Credits: (3-0) 3**
- MATH 443/543 Data Analysis **Credits: (3-0) 3**
- MATH 447/547 Design of Experiments **Credits: (3-0) 3**
- MATH 451/551 Math Modeling **Credits: (3-0) 3**
- MATH 471 Numerical Analysis I **Credits: (3-0) 3**
- MATH 486 Statistical Quality and Process Control **Credits: (3-0) 3**
- CSC 215 Programming Techniques **Credits: (4-0) 4**

Mining Engineering, BS

Contact Information

Dr. Lance Roberts

Professor and Department Head
Mining Engineering and Management Department
MI 235B
(605) 394-1973
E-mail: Lance.Roberts@sdsmt.edu

Faculty

Professors Roberts, Tukkaraja, Brickey, McCormick, Allard, and Bowron.

Emeritus Professor Kliche

Adjunct Faculty

Mr. Richard Chancellor.

Accreditation

The Bachelor of Science program in Mining Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>, 415 North Charles Street, Baltimore, MD 21201, Phone +1.410.347.7700.

Mining Engineering Curriculum/Checklist

Students are responsible for checking with their advisors for any program modifications that may occur after the publication of this catalog.

Freshman Year

First Semester

- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6) ¹
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1** (Goal 6) ¹
- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5) ¹
- MEM 110L Introduction to Geological and Mining Engineering **Credits: (0-1) 1**
- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1) ¹
- Gen Ed Goal 3 and Goal 4 Elective(s) **Credits: 3** ¹
- Physical Education **Credits: 1**

Total: 16

Second Semester

- MATH 125 Calculus II **Credits: (4-0) 4**
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3** (Goal 6) ¹
- MEM 120 Introduction to Mining, Sustainable Development, and Safety **Credits: (3-0) 3**
- Gen Ed Goal 3 and Goal 4 Elective(s) **Credits: 6** ¹

Total: 16

Sophomore Year

First Semester

- MATH 205 Mining and Management Mathematics I **Credits: (2-0) 2**
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**
- EM 216 Statics and Dynamics **Credits: (4-0) 4**
- MEM 201L Surveying for Mineral Engineers **Credits: (0-2) 2**
- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1) ¹
- ECON 201 Microeconomics **Credits: 3** (Goal 3) ^{1,2}
- **OR**
- ECON 202 Macroeconomics **Credits: 3** (Goal 3) ^{1,2}

Total: 17

Second Semester

- MATH 321 Differential Equations **Credits: (3-0) 3**
- GEOE 221/221L Geology for Engineers/Lab **Credits: (2-1) 3**
- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 2) ¹
- MET 220 Mineral Processing and Resource Recovery **Credits: (3-0) 3**
- MEM 204 Surface Mining Methods and Unit Operations **Credits: (3-0) 3**

Total: 15

Junior Year

First Semester

- MEM 301/301L Computer Applications in Mining/Lab **Credits: (1-1) 2**
- MEM 303 Underground Mining Methods and Equipment **Credits: (3-0) 3**
- MEM 305 Introduction to Explosives Engineering **Credits: (3-0) 3**
- MEM 314/314L Mineralogy and Petrology for Mining Engineers/Lab **Credits: (3-1) 4**
- EE 303/303L Basic Circuits/Lab **Credits: (2-1) 3**
- MEM 376 Managerial Finance for Mining Engineers **Credits: (3-0) 3**

Total: 18

Second Semester

- MEM 302 Mineral Economics and Finance **Credits: (3-0) 3**
- MEM 304/304L Theoretical and Applied Rock Mechanics/Lab **Credits: (2-1) 3**
- EM 331 Fluid Mechanics **Credits: (3-0) 3**
- IENG 366 Engineering Management **Credits: (3-0) 3**
- AES 404/504 Atmospheric Thermodynamics **Credits: 2 or 3**
- MEM 307 Mineral Exploration and Geostatistics **Credits: (3-0) 3**

Total: 17

Senior Year

First Semester

- MEM 476 International Business for Mining Engineers **Credits: (3-0) 3**
- MEM 401/401L Theoretical and Applied Mine Ventilation/Lab **Credits: (3-1) 4**
- MEM 466 Mine Management **Credits: (2-0) 2**
- MEM 464 Mine Design and Feasibility Study **Credits: (0-4) 4**
- MEM 4XX Mining Technical Elective **Credits: 3**

Total: 16

Second Semester

- MEM 4XX Mining Technical Elective **Credits: 3**
- GEOL 322/322L Structural Geology/Lab **Credits: (2-1) 3**
- MEM 405 Mine Permitting and Reclamation **Credits: (3-0) 3**
- MEM 446 Human Resource Management for Mining Engineers **Credits: (3-0) 3**
- Department Approved Elective **Credits: 3**

Total: 15

130 credits required for graduation

Curriculum Notes

¹ Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

² May be offered through BHSU, DSU, NSU, SDSU, or USD. Check WebAdvisor for current offerings.

MEM Elective (6 cr hr)

Select 6 credits from:

- MEM 410/510 Advanced Mineral Economics for Managers **Credits: (3-0) 3**
- MEM 420/520 Advanced Tunneling and Underground Excavation **Credits: (3-0) 3**
- MEM 425/525 Advanced Rock Mechanics **Credits: (3-0) 3**
- MEM 430/530 Resource Industry Mergers and Acquisitions **Credits: (3-0) 3**
- MEM 433/433L/533/533L Advanced Mine Planning & Design **Credits: (2-1) 3**
- MEM 435/535 Resource Industry Finance and Accounting **Credits: (3-0) 3**
- MEM 440/540 Advanced Mine Ventilation and Environmental Engineering **Credits: (3-0) 3**
- MEM 445/545 Advanced Geostatistics and Grade Estimations **Credits: (2-1) 3**
- MEM 445L/545L Advanced Geostatistics and Grade Estimations **Credits: (0-1) 1**
- MEM 450/550 Rock Slope Engineering **Credits: (3-0) 3**
- MEM 480/580 Advanced Explosives and Blasting **Credits: (3-0) 3**
- MEM 491 Independent Study **Credits: 1 to 3**
- MEM 492/592 Topics **Credits: 1 to 3**

Department Approved Elective

Select 3 credits from engineering courses including MEM prefix. Requires advisor approval. These courses are typically at a 300-level or higher.

Physics, BS

Contact Information

Dr. Richard W. Schnee

Department of Physics

Electrical Engineering/Physics 223

(605) 394-2364

E-mail: Richard.Schnee@sdsmt.edu

Physics Curriculum Checklist

Students are responsible for checking with their advisors for any program modifications that may occur after the publication of this catalog.

Freshman Year

First Semester

- MATH 123 Calculus I **Credits: (4-0) 4** (Goal 5) ¹
- CHEM 112 General Chemistry I **Credits: (3-0) 3** (Goal 6) ¹
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1** (Goal 6) ¹
- ENGL 101 Composition I **Credits: (3-0) 3** (Goal 1) ¹
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ¹

Total: 14

Second Semester

- MATH 125 Calculus II **Credits: (4-0) 4**
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3** (Goal 6) ¹
- Program Elective(s) **Credits: 3**
- CSC 150/150L Computer Science I/Lab **Credits: (2-1) 3**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ¹

Total: 16

Sophomore Year

First Semester

- MATH 225 Calculus III **Credits: (4-0) 4**
- PHYS 213/213-A University Physics II/Recitation **Credits: (3-0) 3**
- PHYS 213L University Physics II Laboratory **Credits: (0-1) 1**
- ENGL 279 Technical Communications I **Credits: (3-0) 3** (Goal 1) ¹
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ¹

Total: 14

Second Semester

- MATH 321 Differential Equations **Credits: (3-0) 3**
- ENGL 289 Technical Communications II **Credits: (3-0) 3** (Goal 1) ¹
- PHYS 225 Vibrations, Waves, and Optics **Credits: (3-0) 3**
- General Education Goal 3 or 4 Elective(s) **Credits: 3** ¹
- Program Elective(s) **Credits: 4**

Total: 16

Junior Year

First Semester

- Program Elective(s) **Credits: 3**
- PHYS 341 Thermodynamics **Credits: (2-0) 2**
- PHYS 343 Statistical Physics **Credits: (2-0) 2**
- PHYS 331 Introduction to Modern Physics **Credits: (3-0) 3**
- PHYS 312 Experimental Physics Design I **Credits: (0-2) 2**
- PHYS 451/551 Classical Mechanics **Credits: (4-0) 4**

Total: 16

Second Semester

- MATH 315 Linear Algebra **Credits: (3-0) 3**
- PHYS 350 Advanced Physics Laboratory **Credits: (0-3) 3**
- PHYS 471/571 Quantum Mechanics **Credits: (4-0) 4**
- PHYS 314 Experimental Physics Design II **Credits: (0-2) 2**
- Program Elective(s) **Credits: 4**

Total: 16

Senior Year

First Semester

- PHYS 421/521 Electromagnetism **Credits: (4-0) 4**
- PHYS 412 Advanced Design Projects I **Credits: (0-3) 3**
- PHYS 361 Optics **Credits: (3-0) 3**²
- PHYS 481/581 Mathematical Physics **Credits: 3 to 4 credits**²

Total: 14

Second Semester

- PHYS 433/533 Nuclear and Elementary Particle Physics **Credits: (3-0) 3**²
- PHYS 439/539 Condensed Matter Physics **Credits: 3 to 4 credits**
- PHYS 414 Advanced Design Projects II **Credits: (0-4) 4**
- Program Elective(s) **Credits: 3**

Total: 14

120 credits required for graduation

Curriculum Notes

At the end of the sophomore year 12 hours of electives must include 6 hours in humanities (in two disciplines or in a sequence of foreign language courses) and 6 hours in social sciences (in two disciplines) to fulfill the Board of Regents General Education Requirements. These courses must be at the 100 or 200 level.

The electives must contain a minimum of 12 hours in social sciences and humanities (100 or 200 level) and 3 hours of mathematics or computer science at the 200 level or above. 10 credit hours of military science may also be used as electives.

¹ Fulfills General Education requirement. Students should consult the "General Education Requirements" section of this catalog for a complete listing of all general education requirements.

² Courses offered alternate years.

Recommended Electives

Atmospheric Physics

Recommended electives for atmospheric physics include:

- AES 201 Introduction to Atmospheric Sciences **Credits: (3-0) 3**
- AES 404/504 Atmospheric Thermodynamics **Credits: 2 or 3**
- * AES 460/560 Atmospheric Dynamics **Credits: (3-0) 3**
- * AES 401/501 Atmospheric Physics **Credits: (3-0) 3**

Computational Physics

Recommended electives for computational physics include:

- CSC 215 Programming Techniques **Credits: (4-0) 4**
- CSC 340 Software Engineering and Design **Credits: (3-0) 3**
- MATH 373 Introduction to Numerical Analysis **Credits: (3-0) 3**
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**
- MATH 443/543 Data Analysis **Credits: (3-0) 3**
- MATH 447/547 Design of Experiments **Credits: (3-0) 3**
- MATH 451/551 Math Modeling **Credits: (3-0) 3**

Engineering Physics

Recommended electives for engineering physics include:

- ME 216 Introduction to Solid Mechanics **Credits: (3-0) 3**
- ME 221 Dynamics of Mechanisms **Credits: (3-0) 3**
- MET 231 Structures and Properties of Materials Lab **Credits: (0-1) 1**
- MET 232 Properties of Materials **Credits: (3-0) 3**
- * ME 316 Solid Mechanics **Credits: (3-0) 3**
- ME 331 Thermo Fluid Dynamics **Credits: (3-0) 3**
*
- ME 477 Mechanical Engineering Design I **Credits: (0-2) 2**
- ME 481L Advanced Production Development Lab I **Credits: (0-1) 1**
- ME 479 Mechanical Systems Design II **Credits: (0-2) 2**
- MET 330 Physics of Metals **Credits: (3-0) 3**
- MET 330L Physics of Metals Lab **Credits: (0-1) 1**
- EE 220/220L Circuits I/Lab **Credits: (3-1) 4**
- EE 301/301L Introduction to Circuits, Machines, and Systems/Lab **Credits: (3-1) 4**
- EE 320/320L Electronics I/Lab **Credits: (3-1) 4**
- EE 322/322L Electronics II/Lab **Credits: (3-1) 4**

Medical Physics

Recommended electives for medical physics include:

- BIOL 221 Human Anatomy **Credits: (3-0) 3**
- BIOL 221L Human Anatomy Lab **Credits: (0-1) 1**
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**
- BIOL 326 Biomedical Physiology **Credits: (3-0) 3**
- BIOL 326L Biomedical Physiology Lab **Credits: (0-1) 1**

General Physics

Recommended electives for general physics include:

- PHYS 275 Relativity **Credits: (3-0) 3**
- MATH 221 Introduction to Discrete Mathematics **Credits: (2-0) 2**
- MATH 373 Introduction to Numerical Analysis **Credits: (3-0) 3**
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**
- MATH 382 Probability Theory and Statistics II **Credits: (3-0) 3**
- MATH 421 Complex Analysis **Credits: (3-0) 3**
- MATH 432/532 Partial Differential Equations **Credits: (3-0) 3**
- MATH 443/543 Data Analysis **Credits: (3-0) 3**
- MATH 447/547 Design of Experiments **Credits: (3-0) 3**
- MATH 451/551 Math Modeling **Credits: (3-0) 3**
- CSC 250 Computer Science II **Credits: (4-0) 4**
- CHEM 114 General Chemistry II **Credits: (3-0) 3**
- CHEM 342 Physical Chemistry I **Credits: 2 to 3**
- CHEM 344 Physical Chemistry II **Credits: 2 to 3**
- CHEM 352 Systematic Inorganic Chemistry **Credits: (3-0) 3**

Master of Engineering

Master of Engineering

Contact Information

Program Director

Dr. Maribeth Price, Dean of Graduate Education

Maribeth.Price@sdsmt.edu

605-394-1763

Civil & Environmental Engineering Emphasis

Dr. Marc Robinson

Marc.Robinson@sdsmt.edu

605-394-2563

Electrical Engineering Emphasis

Dr. Magesh Rajan

Magesh.Rajan@sdsmt.edu

605-394-1219

Materials Engineering & Science Emphasis

Dr. Jon Kellar

Jon.Kellar@sdsmt.edu

(605) 394-2343

Overview

The Master of Engineering program at SD Mines is a course-based professional non-thesis master's degree program with three technical emphasis areas in Civil & Environmental Engineering (CEE), Electrical Engineering (EE), and Materials Engineering & Science (MES).

No Accelerated MS option is available for this degree.

Degree requirements for the Master of Engineering

Distribution of credits

Core requirements: 21-22 credits

Research or project requirements: 0-3 credits

Elective requirements: 6-9 credits

Total credits: 30

A minimum of 15 credits of the 30 required must be taken at the 600 level or above.

Core requirements

A minimum of 15 credits of engineering content in one of three available technical emphasis areas as described below.

A minimum of 6 credits of management courses must be selected from the list below.

Civil and Environmental Engineering emphasis area

- At least 15 credit hours of graduate coursework with the CEE prefix (500 level courses and above)
- No more than 3 credits may be from CEE 691, CEE 788, CEE 791, or CP 697
- The following courses may not be applied to the M. Eng. degree: CEE 790 and CEE 798.

Electrical Engineering Emphasis

- EE 626 Wireless Communications **Credits: (3-0) 3**
- EE 655 Linear System Theory **Credits: (3-0) 3**
- EE 680 Engineering Electromagnetics **Credits: (3-0) 3**
- EE 431/431L/531/531L Power Systems/Lab **Credits: (3-1) 4**
- Technical Electives **Credits: 3**

Materials Engineering and Science Emphasis

- MES 601 Fundamentals of Materials Engineering **Credits: (3-0) 3**
- MES 603 Condensed Matter Physics **Credits: (4-0) 4**
- MES 604 Chemistry of Materials **Credits: (4-0) 4**
- Technical Electives **Credits: 4**

Management Courses List

Courses are available in any of our three online MS professional programs of Engineering Management (ENGM), Construction Engineering and Management (CEM), and Mining Engineering and Management (MEM). Students select a minimum of two of the courses (6 credits) listed below to meet the management course requirement.

- ENGM 640 Business Strategy **Credits: (3-0) 3**
- ENGM 661 Engineering Economics for Managers **Credits: (3-0) 3**
- ENGM 642 Engineering Management and Labor Relations **Credits: (3-0) 3**
- IENG 466/566 Project Planning and Control **Credits: (3-0) 3**
- ENGM 620 Quality Management **Credits: (3-0) 3**
- ENGM 663 Operations Planning **Credits: (3-0) 3**
- ENGM 621 Statistical Process Control **Credits: (3-0) 3**
- ENGM 745 Forecasting for Business and Technology **Credits: (3-0) 3**
- CEM 619 Construction Company Management **Credits: (3-0) 3**
- CEM 620 Leading and Managing Design Organizations **Credits: (3-0) 3**
- MEM 435/535 Resource Industry Finance and Accounting **Credits: (3-0) 3**
- MEM 430/530 Resource Industry Mergers and Acquisitions **Credits: (3-0) 3**
- MEM 410/510 Advanced Mineral Economics for Managers **Credits: (3-0) 3**
- MEM 630 Mining Law and Environment **Credits: (3-0) 3**

Research or project requirements

The completion of a project or non-thesis research is optional for this degree.

- CEE 788 or EE 788 or MES 788 Non-thesis research, **Credit to be arranged****

** Up to 3 credits of CEE 788 may be counted toward the Civil and Environmental Engineering emphasis

**Up to 2 credits of EE 788 may be counted toward the Electrical Engineering emphasis.

**Up to 2 credits of MES 788 may be counted toward the Materials Engineering and Science emphasis.

Elective requirements

- An additional 6-9 credits of coursework may be taken in either the technical area or in management.

All electives must be approved by the student's advisor or advisory committee.

Examinations

Each student is required to complete a written Master's examination to graduate from the program. The Master's exam is administered by the department or program for each emphasis area, and is given in the student's final semester before graduation. The student is presented with a list of problems or issues drawn from the degree emphasis and is asked to prepare a proposal for a project intended to solve one of them. The proposal should address the technical background of the problem, the promised deliverables, the management structure of the project team, a work plan for completion, and a costing and budget analysis, in fifteen pages or less. The proposal must be submitted to the emphasis area program coordinator no later than the last day to hold a thesis or dissertation defense as scheduled by the Office of Graduate Education. The program coordinator must report the examination results to the Office of Graduate Education using the form on the Graduate Education web page.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Master of Science

Atmospheric and Environmental Sciences, MS

Contact Information

Dr. William J. Capehart, Program Director

Atmospheric and Environmental Sciences

Mineral Industries 201

(605) 394-1994

E-mail: William.Capehart@sdsmt.edu

MS in Atmospheric and Environmental Sciences

The MS in Atmospheric Sciences offers two specializations, one in Environmental Science and one in Meteorology. Both specializations are available in a thesis option or a non-thesis option.

SD Mines undergraduate students admitted to the Accelerated MS may apply up to 9 credits of approved 400/500/600 level AES coursework toward both the BS and the MS degrees.

Degree requirements for the Environmental Science specialization (thesis option)

Distribution of credits

Core requirements: 5 credits

Research or project requirements: 6-9 credits

Elective requirements: 17-21 credits

Total credits: 32

A minimum of 16 credits of the 32 required must be taken at the 600 level or above.

Core requirements

- AES 406/506 Global Environmental Change **Credits: (3-0) 3**
- AES 690 Seminar **Credits: (1-0) 1 ***

* Two credits of AES 690 are required.

Research or project requirements

The completion of a master's thesis, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- AES 798 Thesis **Credits: Credit to be arranged. ****

** At least 6 credits of AES 798 are required. No more than 9 credits of AES 798 may be counted toward the degree.

Elective requirements

- Fifteen (15) credit hours of coursework in Atmospheric and Environmental Sciences (AES prefix) at the 500 level or above
- Six to nine (6-9) credits of courses in Atmospheric and Environmental Sciences or another program

All electives must be approved by the student's thesis committee.

Examinations

A thesis defense and final oral examination are required for this degree.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Degree requirements for the Environmental Science specialization (non-thesis option)

Distribution of credits

Core requirements: 11 credits

Research or project requirements: 0-3 credits

Elective requirements: 18-21 credits

Total credits: 32

A minimum of 16 credits of the 32 required must be taken at the 600 level or above.

Core requirements

The core courses must be taken at the 500 level or above.

- AES 403/503 Biogeochemistry **Credits: (3-0) 3**
- AES 406/506 Global Environmental Change **Credits: (3-0) 3**
- AES 775 Applied Freshwater Science **Credits: (3-0) 3**
- AES 690 Seminar **Credits: (1-0) 1 ***

* Two credits of AES 690 are required.

Research or project requirements

A project is optional for this degree.

- AES 788 Master's Research Projects **Credits: 1 to 3 ****

**Up to 3 credits of AES 788 may be counted toward the degree.

Elective requirements

- At least 18 additional credit hours of coursework

All electives must be approved by the student's academic advisor.

Examinations

No final degree examination is required for the non-thesis option. Individual courses may hold final examinations as part of the course.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Degree requirements for the Meteorology specialization (thesis option)

Distribution of credits

Core requirements: 8-20 credits

Research or project requirements: 6-9 credits

Elective requirements: 3-18 credits

Total credits: 32

A minimum of 16 credits of the 32 required must be taken at the 600 level or above.

Core requirements

- AES 406/506 Global Environmental Change **Credits: (3-0) 3**
- AES 419/519 High-Performance Computing in Earth Sciences **Credits: (3-0) 3**
- AES 690 Seminar **Credits: (1-0) 1 ***

* Two credits of AES 690 are required.

An appropriate computer applications course may be substituted for AES 419/519 if approved by the student's advisory committee.

Students entering the program with a bachelor's degree in fields outside of atmospheric sciences or meteorology must take the following courses:

- AES 450/450L Synoptic Meteorology I/Lab **Credits: (2-1) 3**
- AES 401/501 Atmospheric Physics **Credits: (3-0) 3**
- AES 455/455L/555/555L Synoptic Meteorology II/Lab **Credits: (2-1) 3**
- AES 460/560 Atmospheric Dynamics **Credits: (3-0) 3**

Research or project requirements

The completion of a master's thesis, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- AES 798 Thesis **Credits: Credit to be arranged.** **
** At least 6 credits of AES 798 are required. No more than 9 credits of AES 798 may be counted toward the degree.

Elective requirements

- Three to eighteen (3-18) credits of other electives
All electives must be approved by the student's advisory committee.

Examinations

A thesis defense and final oral examination are required for this degree.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Degree requirements for the Meteorology specialization (non-thesis option)

Distribution of credits

Core requirements: 20 credits
Research or project requirements: 0-3 credits
Elective requirements: 9-12 credits
Total credits: 32

A minimum of 16 credits of the 32 required must be taken at the 600 level or above.

Core requirements

For the Meteorology Specialization, the following courses are required at the graduate (500) level:

- AES 401/501 Atmospheric Physics **Credits: (3-0) 3**
- AES 406/506 Global Environmental Change **Credits: (3-0) 3**
- AES 419/519 High-Performance Computing in Earth Sciences **Credits: (3-0) 3**
- AES 430/530 Radar Meteorology **Credits: (3-0) 3**
- AES 455/455L/555/555L Synoptic Meteorology II/Lab **Credits: (2-1) 3**
- AES 460/560 Atmospheric Dynamics **Credits: (3-0) 3**
- AES 690 Seminar **Credits: (1-0) 1 ***
* Two credits of AES 690 are required.

Research or project requirements

A project is optional for this degree.

- AES 788 Master's Research Projects **Credits: 1 to 3** **
**Up to 3 credits of AES 788 may be counted toward the degree.

Elective requirements

- Six to nine (6-9) credits of other electives

All electives must be approved by the student's academic advisor.

Examinations

No final degree examination is required for the non-thesis option. Individual courses may hold final examinations as part of the course.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Biomedical Engineering, MS

Contact Information

Dr. Richard Sinden (Program Coordinator)

Department of Chemistry and Applied Biological Sciences
Chemical and Biological Engineering/Chemistry 2206
(605) 394-1678
E-mail: Richard.Sinden@sdsmt.edu

Dr. Grant Crawford (Associate Program Coordinator)

Department of Materials and Metallurgical Engineering
MI 104
(605) 394-5133
Email: Grant.Crawford@sdsmt.edu

MS in Biomedical Engineering

Offered jointly with University of South Dakota (USD). The MS in Biomedical Engineering is offered with a thesis option and a non-thesis option.

SD Mines students accepted to the Accelerated MS option may apply up to 12 credits of 400/500/600 level courses taken as an undergraduate toward both the BS and the MS degrees.

Degree requirements for thesis option

Distribution of credits

Core requirements: 17-18 credits
Research or project requirements: 9-10 credits
Elective requirements: 3 credits
Total credits: 30

A minimum of 15 credits of the 30 required must be taken at the 600 level or above.

Core requirements

These courses are required for the degree.

- BME 408/508 Biomedical Engineering **Credits: (3-0) 3**
- BME 601 Biomaterials **Credits: (3-0) 3**
- BME 602 Anatomy and Physiology for Engineers **Credits: (3-0) 3**
- BME 603 Molecular Biology for Engineers **Credits: (3-0) 3**
- BME 690 Seminar **Credits: (1-0) 1 ***
- **OR**
- BME 790 Seminar **Credits: (1-0) 1 ***

*Three credits of BME 690 or BME 790 are required.

Experimental Design/Analysis Requirement: one of these courses is required for the degree:

- BME 710 Experimental Design and Data Analysis in Biological Engineering **Credits: (3-0) 3**
- MATH 447/547 Design of Experiments **Credits: (3-0) 3**
- CBE 488/588 Applied Design of Experiments for the Chemical Industry **Credits: (2-0) 2**

Research or project requirements

The completion of a master's thesis, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree. A minimum of 9 thesis credits are required.

- BME 798 Thesis **Credits: Credits to be arranged ****

** A minimum of 9 credits of BME 798 is required for the degree. A maximum of 10 credits of BME 798 may be counted toward the degree.

Elective requirements

- BME Electives **Credits: 3**

Elective courses in the area of the student's intended research are to be selected in consultation with the student's advisory committee.

Examinations

Committee Meetings: Student performance is evaluated each semester through the written Research Progress Report and formal committee meetings. A student's Advisor and Advisory Committee will evaluate the student's accomplishments in academics, research and overall progress toward the degree.

Thesis Defense: A thesis defense and an oral final examination are required for this degree

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Degree requirements for non-thesis option

Distribution of credits

Core requirements: 17-18 credits

Research or project requirements: 0-6 credits

Elective requirements: 9-15 credits

Total credits: 32

A minimum of 16 credits of the 32 required must be taken at the 600 level or above.

Core requirements

These courses are required for the degree:

- BME 601 Biomaterials **Credits: (3-0) 3**
- BME 602 Anatomy and Physiology for Engineers **Credits: (3-0) 3**
- BME 603 Molecular Biology for Engineers **Credits: (3-0) 3**
- BME 408/508 Biomedical Engineering **Credits: (3-0) 3**
- BME 675 Non-Thesis Practical Experience and Technical Communication **Credits: 1 to 3 ***
*Three credits of BME 675 are required. BME 690/790 may be used as a replacement for BME 675 with approval from the BME program coordinator.

Experimental Design/Analysis Requirement: one of these courses is required for the degree:

- BME 710 Experimental Design and Data Analysis in Biological Engineering **Credits: (3-0) 3**
- MATH 447/547 Design of Experiments **Credits: (3-0) 3**
- CBE 488/588 Applied Design of Experiments for the Chemical Industry **Credits: (2-0) 2**

Research or project requirements

A project is optional for this degree.

- BME 788 Master's Research Problems/Project **Credits: 1 to 12 ****
**Up to 6 credits of BME 788 may be counted toward the degree.

Elective requirements

Elective courses in the area of the student's intended research are to be selected in consultation with the student's advisor committee.

- BME Electives **Credits: 9-15**

Examinations

No final degree examination is required for the non-thesis option. Individual courses may hold final examinations as part of the course.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Chemical Engineering, MS

Contact Information

Dr. Todd Menkhaus, Program Coordinator

Department of Chemical and Biological Engineering

(605) 394-2422 Dept: (605) 394-2421

E-mail: Todd.Menkhaus@sdsmt.edu

<http://www.sdsmt.edu/CBE/>

MS in Chemical Engineering

The MS in Chemical Engineering offers both a thesis option and a non-thesis option.

SD Mines students admitted to the Accelerated MS option may apply up to 12 credits taken at the 400/500/600 level as an undergraduate to both the BS and the MS degrees.

Degree requirements for thesis option

Distribution of credits

Core requirements: 13 credits

Research or project requirements: 6 credits

Elective requirements: 11 credits

Total credits: 30

A minimum of 15 credits of the 30 required must be taken at the 600 level or above.

Core requirements

A core curriculum for all M.S. candidates in chemical engineering includes the following courses or approved substitutions:

- CBE 605 Applied Engineering Mathematics **Credits: (3-0) 3**
- CBE 611 Chemical Engineering Transport Phenomena **Credits: (3-0) 3**
- CBE 444/544 Reactor Design **Credits: (3-0) 3 ***
- CBE 621 Advanced Chemical Engineering Thermodynamics I **Credits: (3-0) 3**
- CBE 790 Seminar **Credits: (1-0) 1**

*MS students must take CBE 544

Research or project requirements

The completion of a master's thesis, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- CBE 798 Thesis **Credits: Credit to be arranged.** *
*At least 6 credits of CBE 798 are required. No more than 6 credits of CBE 798 may be applied to the degree.

Elective requirements

All electives must be approved by the student's advisor or advisory committee.

- Chemical Engineering course electives with a CBE prefix: Credits 6
- Additional electives: Credits: 5

Examinations

An oral thesis defense for the thesis degree, as well as final examination in the field of chemical engineering, is required prior to the completion of the graduate study.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Degree requirements for non-thesis option

Distribution of credits

Core requirements: 13 credits

Research or project requirements: 2 credits

Elective requirements: 17 credits

Total credits: 32

A minimum of 16 credits of the 32 required must be taken at the 600 level or above.

Core requirements

A core curriculum for all M.S. candidates in chemical engineering includes the following courses or approved substitutions:

- CBE 605 Applied Engineering Mathematics **Credits: (3-0) 3**
- CBE 611 Chemical Engineering Transport Phenomena **Credits: (3-0) 3**
- CBE 444/544 Reactor Design **Credits: (3-0) 3 ***
- CBE 621 Advanced Chemical Engineering Thermodynamics I **Credits: (3-0) 3**
- CBE 790 Seminar **Credits: (1-0) 1**

*MS students must take CBE 544

Research or project requirements

A project is required for this degree.

- CBE 788 Master's Research Problems/Project **Credits: Credit to be arranged. ****
**A minimum of 2 credits of CBE 788 is required. A maximum of 2 credits of CBE 788 may be applied to the degree.

Elective requirements

All electives must be approved by the student's advisor or advisory committee.

- Chemical Engineering course electives with a CBE prefix: Credits 9
- Additional electives: Credits: 8

Examinations

An oral project examination and/or written project report for the non-thesis degree, as well as final examination in the field of chemical engineering, are required prior to the completion of the graduate study.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Civil and Environmental Engineering, MS

Contact Information

Dr. James Stone, MS (Thesis) Graduate Coordinator

Department of Civil and Environmental Engineering

CM 314

Phone: (605) 394-2443

E-mail: James.Stone@sdsmt.edu

Dr. Marc Robinson, MS (Non-Thesis) and Graduate Coordinator

Department of Civil and Environmental Engineering

CM 243

Phone: (605) 394-2563

E-mail: Marc.Robinson@sdsmt.edu

MS in Civil and Environmental Engineering

The Department of Civil and Environmental Engineering offers both a thesis and non-thesis MS degree in the following emphasis areas: environmental, water resources, geotechnical/materials, and structural engineering.

SD Mines undergraduates admitted to the Accelerated MS option may apply up to 9 credits of 500/600-level courses taken as an undergraduate to both the BS and MS degree.

Degree requirements for thesis option

Distribution of credits

Core requirements: 1 credit

Research or project requirements: 6 credits

Elective requirements: 24 credits

Total credits: 31

A minimum of 16 credits of the 31 required credits must be taken at the 600-level or higher.

Core requirements

- CEE 600 Research Methods **Credits: (1-0) 1**

Research or project requirements

Candidacy for the MS CENE degree with the thesis option is contingent upon the student's aptitude to do research.

- CEE 798 Thesis **Credits: Credit to be arranged. ***

*Students must complete 6 credits of CEE 798. No more than 6 credits may be counted toward the degree.

Non-thesis Research (CEE 788) is not applicable toward the thesis option.

Elective requirements

- At least 14 credit hours of graduate level courses with the CEE prefix.
- No more than 3 credits may be from a combination of CEE 691, CEE 790, CEE 791, or CP 697.

All electives must be approved by the student's advisor or advisory committee.

Examinations

The thesis must constitute an original contribution to knowledge in civil and environmental engineering and must be successfully defended at a final public oral presentation and examination. Students are expected to complete a written thesis proposal and present it to their committee at least one semester before defending the thesis.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Degree requirements for non-thesis option

Distribution of credits

Core requirements: 0 credits

Research or project requirements: 0 credits

Elective requirements: 33 credits

Total credits: 33

A minimum of 18 credits of the 33 required credits must be taken at the 600-level or higher.

Core requirements

No specific courses are required for this degree.

Research or project requirements

A thesis, project paper, or final examination is not required; this is a course-work only degree.

Elective requirements

This program requires a total of 33 credits of coursework to be selected by the student in consultation with the student's advisor or advisory committee. The program of study must meet these criteria:

- At least 20 credit hours of graduate level courses with the CEE prefix.
- At least 18 credit hours must be taken at the 600-level or higher.
- No more than 3 credits may be from a combination of CEE 691, CEE 788, CEE 790, CEE 791, CEE 798, or CP 697.

Examinations

No final degree examination is required for the non-thesis option. Individual courses may hold final examinations as part of the course.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Computational Sciences and Robotics, MS

Contact Information

Dr. Christer Karlsson, Program Coordinator

Department of Mathematics and Computer Science

McLaury 211A

Dept: (605) 646-3130

E-mail: Christer.Karlsson@sdsmt.edu

www.sdsmt.edu/CSR

MS in Computational Sciences and Robotics

The Master of Science in Computational Sciences and Robotics (CSR) offers both a thesis option and a non-thesis option.

SD Mines students admitted to the Accelerated MS option may apply up to 10 credits of 500/600 level courses taken as an undergraduate to both the BS and the MS degrees.

Degree requirements for thesis option

Distribution of credits

Core requirements: 6 credits

Research or project requirements: 6 credits

Elective requirements: 18 credits

Total credits: 30

A minimum of 15 credits of the 30 required must be taken at the 600 level or above.

Core requirements

- CSC 415/415L/515/515L Introduction to Robotics/Lab **Credits: (3-1) 4**
- CSC 790 Seminar **Credits: (1-0) 1 ***

* Two credits of CSC 790 are required.

Research or project requirements

The completion of a master's thesis based on individual research, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- CSC 798 Thesis **Credits: Credit to be arranged. ****

** At least 6 credits of 798 are required. No more than 6 credits of CSC 798 may be counted toward the degree.

Elective requirements

- At least 18 credits of elective coursework

All electives must be approved by the student's advisor and advisory committee.

Examinations

A thesis defense and an oral final examination are required for this degree.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Degree requirements for non-thesis option

Distribution of credits

Core requirements: 6 credits

Research or project requirements: 3 credits

Elective requirements: 24 credits

Total credits: 33

A minimum of 17 credits of the 33 required must be taken at the 600 level or above.

Core requirements

- CSC 415/415L/515/515L Introduction to Robotics/Lab **Credits: (3-1) 4**
- CSC 790 Seminar **Credits: (1-0) 1 ***

* Two credits of CSC 790 are required.

Research or project requirements

The completion of a master's project, approved by the student's graduate advisory is required for this degree.

- CSC 788 Master's Research Problems/Projects **Credits: Credit to be arranged. ****

** At least 3 credits of 798 are required. No more than 3 credits of CSC 788 may be counted toward the degree.

Elective requirements

The CSR electives may be found at the CSR website: www.sdsmt.edu/CSR. All electives must be approved by the student's advisor and the program coordinator.

- At least 24 credits of elective coursework

Examinations

No final degree examination is required for the non-thesis option. Individual courses may hold final examinations as part of the course.

Additional requirements

There is no foreign language requirement for the MS degree in CSR.

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Construction Engineering and Management, MS

Contact Information

Clifford J Bienert

Interim Coordinator

Civil/Mechanical 245

(605)-394-2439

Email: Clifford.Bienert@sdsmt.edu

Dr. Scott J. Kenner, P.E., Department Head

Department of Civil and Environmental Engineering

Civil/Mechanical 122

(605) 394-2513

E-mail: Scott.Kenner@sdsmt.edu

MS in Construction Engineering and Management

The MS in Construction Engineering and Management offers only a non-thesis option based solely on coursework.

SD Mines students admitted to the Accelerated MS option may apply up to 9 credits of 500/600 level courses taken as an undergraduate toward both the BS and MS degrees.

Degree requirements

Distribution of credits

Core requirements: 0 credits

Research or project requirements: 0 credits

Elective requirements: 33 credits

Total credits: 33

A minimum of 18 credits of the 33 required must be taken at the 600 level or higher.

Core requirements

No specific courses are required for this degree.

Research or project requirements

There is no research or project requirement for this degree.

Elective requirements

This program requires a total of 33 credits of coursework to be selected by the student in consultation with the student's advisor or advisory committee. The program of study must meet these criteria:

- At least 18 credit hours must be CEM graduate coursework.
- No more than 3 credit hours may be CEM 691 or CEM 791.
- At least 18 credit hours of coursework must be at the 600 level or higher.
- Undergraduate courses (400 level and below) will not count toward graduation.

These CEM courses are available in person or in distance format:

- CEM 608 Construction Contracts **Credits: (3-0) 3**
- CEM 610 Construction Project Management **Credits: (3-0) 3**
- CEM 612 Construction Estimating **Credits: (3-0) 3**
- CEM 614 Construction Project Scheduling **Credits: (3-0) 3**
- CEM 615 Engineering and Construction Ethics **Credits: (3-0) 3**
- CEM 616 Codes and Standards **Credits: (3-0) 3**
- CEM 619 Construction Company Management **Credits: (3-0) 3**
- CEM 620 Leading and Managing Design Organizations **Credits: (3-0) 3**
- CEM 640 Temporary Structures **Credits: (3-0) 3**
- CEM 665 Construction Equipment Management **Credits: (3-0) 3**
- CEM 706 Managing Sustainable Projects **Credits: (3-0) 3**
- CEM 710 Advanced Construction Management **Credits: (3-0) 3**
- CEM 715 Construction Operations **Credits: (3-0) 3**
- CEM 750 Environmental Permitting **Credits: (3-0) 3**
- CEM 751 Construction Stormwater Management **Credits: (3-0) 3**
- CEM 788 Master's Research Problems and Projects **Credits: Credit to be arranged.**

Examinations

No final degree examination is required for the non-thesis option. Individual courses may hold final examinations as part of the course.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Electrical Engineering, MS

Contact Information

Dr. Magesh T Rajan

Department of Electrical and Computer Engineering

Electrical Engineering/Physics 311

(605) 394-1219

E-mail: Magesh.Rajan@sdsmt.edu

MS in Electrical Engineering

The MS in Electrical Engineering is offered with a thesis option and a non-thesis option (coursework only or including a project).

SD Mines students admitted to the Accelerated MS option may apply up to 12 credits of 500/600 level courses taken as an undergraduate to both the BS and MS degrees.

Degree requirements for thesis option

Distribution of credits

Core requirements: 3 credits

Research or project requirements: 6-9 credits

Elective requirements: 18-21 credits

Total credits: 30

A minimum of 15 credits of the 30 required must be taken at the 600 level or above. Exceptions must be approved by the dean of graduate education.

Core requirements

One of the following courses must be taken:

- EE 655 Linear System Theory **Credits: (3-0) 3**
- EE 626 Wireless Communications **Credits: (3-0) 3**
- EE 680 Engineering Electromagnetics **Credits: (3-0) 3**
- EE 431/431L/531/531L Power Systems/Lab **Credits: (3-1) 4 ***
* Course MUST be taken at 500 level. The lab section is not required.

Research or project requirements

The completion of a master's thesis based on individual research and development, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- **EE 798 Thesis Credits: Credit to be arranged. ****
** At least 6 credits of EE 798 are required for this degree. No more than 9 credits of EE 798 may be applied toward the degree.

Elective requirements

- At least 18-21 elective credits

Students should select their program of study classes with consultation and approval by their major advisor and/or committee or by the M.Sc. EE graduate program coordinator (or his designee) (depending on the degree option being sought). Refer to ECE graduate handbook for detailed suggested course list.

Examinations

A thesis defense and an oral final examination are required for this degree.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Degree requirements for non-thesis option

Distribution of credits

Core requirements: 3 credits

Research or project requirements: 0-6 credits

Elective requirements: 21-27 credits

Total credits: 30

A minimum of 15 credits of the 30 required must be taken at the 600 level or above. Exceptions must be approved by the dean of graduate education.

Core requirements

One of the following courses must be taken:

- **EE 655 Linear System Theory Credits: (3-0) 3**
- **EE 626 Wireless Communications Credits: (3-0) 3**
- **EE 680 Engineering Electromagnetics Credits: (3-0) 3**
- **EE 431/431L/531/531L Power Systems/Lab Credits: (3-1) 4 ***
* Course MUST be taken at 500 level. The lab section is not required.

Research or project requirements

The completion of a master's project is optional for this degree.

- EE 788 Master's Research Problems/Projects **Credits: Credit to be arranged.** **

**Up to 6 credits of EE 788 may be counted toward the degree.

Elective requirements

- At least 21-27 elective credits

Students should select their program of study classes with consultation and approval by their major advisor and/or committee or by the M.Sc. EE graduate program coordinator (or his designee) (depending on the degree option being sought). Refer to ECE graduate handbook for detailed suggested course list.

Examinations

No final degree examination is required for the non-thesis option. Individual courses may hold final examinations as part of the course.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Engineering Management, MS

Contact Information

Dr. Jeffrey C. Woldstad, Professor and Head

Department of Industrial Engineering

LIB 148

(605) 394-2628

E-mail: Jeffrey.Woldstad@sdsmt.edu

MS in Engineering Management

The M.S. in Engineering Management is offered with a thesis option and a non-thesis option. The non-thesis option may be completed online or on-campus. Students completing the thesis option must be on-campus to complete the research requirement.

SD Mines students admitted to the Accelerated MS option may apply up to 12 credits of 400/500/600 level courses taken as an undergraduate to both the BS and MS degrees.

Degree requirements for thesis option

Distribution of credits

Core requirements: 12 credits

Research or project requirements: 6 credits

Elective requirements: 12 credits

Total credits: 30

A minimum of 15 credits of the 30 required must be taken at the 600 level or above.

Core requirements

A minimum of 3 semester hours of required coursework must be completed in each of four discipline areas, for a total of 12 credits. Discipline areas and allowable courses are shown below.

Business/Finance (3 credits)

- ENGM 661 Engineering Economics for Managers **Credits: (3-0) 3**
- ENGM 640 Business Strategy **Credits: (3-0) 3**

Management (3 credits)

- ENGM 642 Engineering Management and Labor Relations **Credits: (3-0) 3**
- IENG 466/566 Project Planning and Control **Credits: (3-0) 3**

Quantitative Methods (3 credits)

- ENGM 435/535 Optimization Techniques **Credits: (3-0) 3**
- ENGM 632 Stochastic Models in Operations Research **Credits: (3-0) 3**
- ENGM 745 Forecasting for Business and Technology **Credits: (3-0) 3**

Operations Management (3 credits)

- ENGM 663 Operations Planning **Credits: (3-0) 3**
- ENGM 620 Quality Management **Credits: (3-0) 3**

Research or project requirements

The completion of a master's thesis, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for the thesis degree. A minimum of 6 credits of ENGM 798 (Thesis Research) must be taken under the direction of the major professor. This work must result in a thesis document that conforms to the standards listed under "Thesis submission requirements" in this catalog.

- ENGM 798 Thesis **Credits: Credit to be arranged ***
* At least 6 credits of ENGM 798 are required for this degree. No more than 6 credits of ENGM 798 may be counted toward the degree.

Elective requirements

- At least 12 credits of electives are required

Any SD Mines IENG or ENGM course not used to satisfy core requirements may be used as an elective. Other courses may be included in the program of study if approved by graduate advisor or major professor and the ENMG program coordinator. In general, these courses are graduate level courses in engineering, business, mathematics or science related to the career objectives of the student. ENGM courses are available in distance learning mode and are listed below.

- ENGM 640 Business Strategy **Credits: (3-0) 3**
- ENGM 650 Safety Management **Credits: (3-0) 3**
- ENGM 655 Ergonomics for Managers **Credits: (3-0) 3**
- ENGM 675 Legal and Ethical Issues in Engineering Management **Credits: (3-0) 3**
- ENGM 625 Innovation and Commercialization **Credits: (3-0) 3**
- ENGM 621 Statistical Process Control **Credits: (3-0) 3**
- ENGM 632 Stochastic Models in Operations Research **Credits: (3-0) 3**
- ENGM 745 Forecasting for Business and Technology **Credits: (3-0) 3**
- ENGM 792 Topics **Credits: 1 to 3**

Examinations

An oral thesis defense is required of all candidates pursuing the thesis option in the MSEM degree program. This defense will serve as the final examination for students in this program.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Degree requirements for non-thesis option

Core requirements: 12 credits

Research or project requirements: 0-5 credits

Elective requirements: 15-20 credits

Total credits: 32

A minimum of 16 credits of the 32 required must be taken at the 600 level or above.

Core requirements

A minimum of 3 semester hours of required coursework must be completed in each of four discipline areas. Discipline areas and allowable courses are shown below.

Business/Finance (3 credits)

- ENGM 661 Engineering Economics for Managers **Credits: (3-0) 3**
- ENGM 640 Business Strategy **Credits: (3-0) 3**

Management (3 credits)

- ENGM 642 Engineering Management and Labor Relations **Credits: (3-0) 3**
- IENG 466/566 Project Planning and Control **Credits: (3-0) 3**

Quantitative Methods (3 credits)

- ENGM 435/535 Optimization Techniques **Credits: (3-0) 3**
- ENGM 632 Stochastic Models in Operations Research **Credits: (3-0) 3**
- ENGM 745 Forecasting for Business and Technology **Credits: (3-0) 3**

Operations Management (3 credits)

- ENGM 663 Operations Planning **Credits: (3-0) 3**
- ENGM 620 Quality Management **Credits: (3-0) 3**

Research or project requirements

Students enrolled in the non-thesis option may choose to complete their degree using coursework only or may complete a research project under the direction of a faculty member. Project requirements vary, but usually required a formal written report.

- ENGM 788 Master's Research Problems/Project **Credits: Credit to be arranged.** *
* Project credits are optional. No more than 5 credits of ENGM 788 may be applied to the degree.

Elective requirements

- At least 15-20 credits of electives are required

Any SD Mines IENG or ENGM course not used to satisfy core requirements may be used as an elective. Other courses may be included in the program of study if approved by graduate advisor or major professor and the ENMG program coordinator. In general, these courses are graduate level courses in engineering, business, mathematics or science related to the career objectives of the student. ENGM courses are available in distance learning mode and are listed below.

- ENGM 640 Business Strategy **Credits: (3-0) 3**
- ENGM 650 Safety Management **Credits: (3-0) 3**
- ENGM 655 Ergonomics for Managers **Credits: (3-0) 3**
- ENGM 675 Legal and Ethical Issues in Engineering Management **Credits: (3-0) 3**
- ENGM 621 Statistical Process Control **Credits: (3-0) 3**
- ENGM 625 Innovation and Commercialization **Credits: (3-0) 3**
- ENGM 632 Stochastic Models in Operations Research **Credits: (3-0) 3**
- ENGM 745 Forecasting for Business and Technology **Credits: (3-0) 3**
- ENGM 792 Topics **Credits: 1 to 3**

Examinations

No final degree examination is required for the non-thesis option. Individual courses may hold final examinations as part of the course.

Additional requirements

When admitted to the program, a graduate advisor will be appointed by the program coordinator. The advisor will work with the student to prepare a program study that reflects the career goals of the student and the available courses. The program of study can be revised at any time, with the concurrence of the graduate advisor or major professor and the ENGM program coordinator. Students in the thesis option will be assisted in finding a major professor and organizing an advisory committee.

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Additional requirements

When admitted to the program, a graduate advisor will be appointed by the program coordinator. The advisor will work with the student to prepare a program study that reflects the career goals of the student and the available courses. The program of study can be revised at any time, with the concurrence of the graduate advisor or major professor and the ENGM program coordinator. Students in the thesis option will be assisted in finding a major professor and organizing an advisory committee.

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Geology and Geological Engineering, MS

Contact Information

Dr. Laurie Anderson, Department Head

Department of Geology and Geological Engineering

Mineral Industries 303

(605) 394-2461

E-mail: Laurie.Anderson@sdsmt.edu

MS in Geology and Geological Engineering

The MS in Geology and Geological Engineering offers two specializations: a Geology specialization and a Geological Engineering specialization.

The thesis option is the only option to which students are admitted.

SD Mines students admitted to the Accelerated MS option may apply up to 9 credits of 500/600 level courses taken as an undergraduate to both the BS and the MS degrees.

For more information on this degree see the Department of Geology and Geological Engineering page under the Graduate Programs Listing in this catalog.

Degree requirements for thesis option

Distribution of Credits

Core requirements: 1 credit

Research requirements: 6 credits

Elective requirements: 23 credits

Total credits: 30

A minimum of 15 credits of the 30 required must be taken at the 600-level or above.

Core requirements

A research planning course must be taken during the first fall semester of enrollment. Students in the Geology specialization take GEOL 700; students in the Geological Engineering specialization take GEOE 700.

- GEOL 700 Developing and Planning Research **Credits: (1-0) 1**
- **OR**
- GEOE 700 Developing and Planning Research **Credits: (1-0) 1**

Research requirements

The completion of a master's thesis, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- GEOL 798 Thesis **Credits: Credit to be arranged.** **

OR

- GEOE 798 Thesis **Credits: 1 to 9** **

** At least 6 credits of 798 are required. No more than 6 credits of 798 may be counted toward the degree.

Elective requirements

Geology Specialization

A minimum of 23 elective credits are required to complete the degree. The candidate's committee is responsible for assisting the student in developing a program of study that prepares the student for his/her intended field of study. The program of study must include:

- One GEOL/GEOE course emphasizing field/analytical methods
- One GEOL/GEOE course emphasizing computational methods

The student's advising committee determines the courses that meet these criteria.

Geological Engineering specialization

A minimum of 23 elective credits are required to complete the degree. All MS students in the Geological Engineering specialization are expected to focus in one of the three areas of groundwater/environmental, geomechanics, or energy/mineral resources. The candidate's committee is responsible for assisting the student in developing a program of study that prepares the student for his/her intended focus area. The program of study must include:

- One GEOL/GEOE course emphasizing field methods
- One GEOL/GEOE course emphasizing analytical methods
- One GEOL/GEOE course emphasizing computational methods

The student's advising committee determines the courses that meet these criteria.

Examinations

Candidates for the MS degree must fulfill all degree requirements of the graduate office and the program. Departmental requirements include a written thesis proposal with oral proposal defense and an oral coursework exam covering course material.

The thesis proposal and its defense will be scheduled through the student's major advisor and will have the thesis committee's approval. A final thesis proposal, which may require revisions following the thesis proposal defense, serves as a contract of expectations for the student's thesis. The thesis proposal defense must take place at least six months prior to the thesis defense. Students must declare any non-disclosure agreements and associated materials or information as an addendum to the thesis proposal document.

The oral comprehensive exam should be scheduled through the student's major advisor with committee approval when the student has substantially completed the required 24 credits of coursework for the MS; the exam must be held at least three months prior to the thesis defense.

Additional requirements

Any physical specimens (and associated documentation) collected, prepared, and cited in a thesis or dissertation are to be deposited in the Museum of Geology as part of the student's work. Guidelines (only available via on-campus or VPN connection) and forms are available.

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Materials Engineering and Science, MS

Contact Information

Dr. Jon J. Kellar, Program Director

Department of Materials and Metallurgical Engineering

Mineral Industries 112

(605) 394-2343

E-mail: Jon.Kellar@sdsmt.edu

MS in Materials Engineering and Science

The MS in Materials Engineering and Science offers both a thesis option and a non-thesis option.

SD Mines students admitted to the Accelerated MS option may apply up to 12 credits of 400/500/600 level credits taken as an undergraduate toward both the BS and the MS degrees.

Degree requirements for thesis option

Distribution of Credits

Core requirements: 15 credits

Research or project requirements: 6 credits

Elective requirements: 9 credits

Total credits: 30

A minimum of 15 credits of the 30 required must be taken at the 600 level or above.

Core requirements

Because students graduating with this degree are expected to have a broad-based fundamental knowledge in both materials engineering and materials science, every student is required to take four core courses and a seminar (see below).

- MES 601 Fundamentals of Materials Engineering **Credits: (3-0) 3**
- MES 602/602L Materials Characterization: Methods and Applications/Lab **Credits: (3-0) 3**
- PHYS 439/539 Condensed Matter Physics **Credits: 3 to 4 credits**
- MES 604 Chemistry of Materials **Credits: (4-0) 4**
- MES 790/890 Seminar **Credits: (1-0) 1 ***

*MES 790 should be taken by MS students and MES 890 by PhD students.

Research or project requirements

The completion of a master's thesis, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- MES 798 Thesis **Credits: Credit to be arranged.** **
** At least 6 credits of MES 798 are required. No more than 6 credits of MES 798 may be counted toward the degree.

Elective requirement

At least 9 credits of elective coursework approved by the student's advisor or advisory committee.

Examinations

A thesis defense and an oral final examination are required for this degree.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Degree requirements for non-thesis option

Distribution of Credits

Core requirements: 15 credits

Research or project requirements: 0-3 credits

Elective requirements: 14-17 credits

Total credits: 32

A minimum of 16 credits of the 32 required must be taken at the 600 level or above.

Core requirements

Because students graduating with this degree are expected to have a broad-based fundamental knowledge in both materials engineering and materials science, every student is required to take four core courses and a seminar (see below).

- MES 601 Fundamentals of Materials Engineering **Credits: (3-0) 3**
- MES 602/602L Materials Characterization: Methods and Applications/Lab **Credits: (3-0) 3**
- PHYS 439/539 Condensed Matter Physics **Credits: 3 to 4 credits**
- MES 604 Chemistry of Materials **Credits: (4-0) 4**
- MES 790/890 Seminar **Credits: (1-0) 1 ***

*MES 790 should be taken by MS students and MES 890 by PhD students.

Research or project requirements

Students who elect to undertake a project should do so under the supervision of a faculty member.

- MES 788 Master's Research Problems/Projects **Credits: Credit to be arranged.** **
** Up to 3 credits of MES 788 may be counted toward the degree.

Elective requirements

At least 15 credits of elective coursework approved by the student's advisor or advisory committee.

Examinations

No final degree examination is required for the non-thesis option. Individual courses may hold final examinations as part of the course.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Mechanical Engineering, MS

Contact Information

Dr. Pierre Larochelle

Head, Department of Mechanical Engineering
Civil Mechanical Building Room #129
(605) 394-2401
Email: Pierre.Larochelle@sdsmt.edu

Dr. Karim Muci

Professor, Department of Mechanical Engineering
Civil Mechanical Building Room #171
(605) 394-2430
Email: Karim.Muci@sdsmt.edu

Leslee Moore

Senior Secretary
Civil Mechanical Building Room #129
(605) 394-2401
Email: Leslee.Moore@sdsmt.edu

MS in Mechanical Engineering

The Master of Science degree program in mechanical engineering can be pursued using either of two (2) equal options, a thesis option or a non-thesis option.

SD Mines students accepted to the Accelerated MS option may apply up to 9 credits of 400/500/600 level courses taken as an undergraduate toward both the BS and the MS degrees.

Degree requirements for thesis option

Distribution of credits

Core requirements: 15 credits
Research or project requirements: 6 credits
Elective requirements: 9 credits
Total credits: 30

A maximum of 9 credits may be taken at the 400/500 level.

Core requirements

- ME 673 Applied Engineering Analysis I **Credits: (3-0) 3**
- ME 773 Applied Engineering Analysis II **Credits: (3-0) 3**

Students are required to take one course from each of the three areas listed below (or approved substitutions) for a total of five core courses. The details of the actual course selections must be developed by the student, the student's academic advisor, and the student's committee.

Thermal Sciences

- ME 612 Transport Phenomena: Momentum **Credits: (3-0) 3**
- ME 613 Transport Phenomena: Heat **Credits: (3-0) 3**
- ME 616 Computations in Transport Phenomena **Credits: (3-0) 3**
- ME 618 Conduction Heat Transfer **Credits: (3-0) 3**
- ME 619 Convection Heat Transfer **Credits: (3-0) 3**
- ME 620 Radiation Heat Transfer **Credits: (3-0) 3**

Mechanical Systems

- ME 623 Advanced Mechanical Vibrations **Credits: (3-0) 3**
- ME 680 Advanced Strength of Materials **Credits: (3-0) 3**
- ME 713 Advanced Solid Mechanics I **Credits: (3-0) 3**
- ME 770 Continuum Mechanics **Credits: (3-0) 3**

Manufacturing and Controls

- ME 683 Advanced Mechanical System Control **Credits: (3-0) 3**
- ME 781 Robotics **Credits: (3-0) 3**
- ME 625 Smart Structures **Credits: (3-0) 3**

Research or project requirements

The completion of a master's thesis, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- ME 798 Thesis **Credits: Credit to be arranged. ****
** At least 6 credits of ME 798 are required. No more than 6 credits of ME 798 may be counted toward the degree.

Elective requirements

- At least 9 credits of elective courses approved by the student's committee

300 level courses are acceptable if outside department and on approved blanket waiver list. Students may enroll in 300/400 level courses only if 500/600 level courses within the major are not being offered, or by written permission of the student's major professor and the department head.

Examinations

A thesis defense and an oral final examination are required for this degree. Upon completion of the thesis, mechanical engineering graduate students electing this option will be examined orally over the written thesis and coursework as prescribed in the Graduate section of the academic catalog. A mechanical engineering graduate student with an accumulated GPA of 3.4 or better in the courses in their graduate program will have their coursework exam combined with the thesis defense. For students having an accumulated GPA of less than 3.4 in the courses in their graduate program, a separate focused coursework oral examination will be administered by the student's graduate committee. The GPA will be computed using midterm grades for the semester in which the student is currently enrolled. The coursework examination will examine primarily concepts and fundamentals of the courses in the student's program of

study, rather than the mechanics of problem solution and will, in general, attempt to establish the student's in-depth knowledge of the course content. The student's graduate committee will select specific courses from the student's graduate program in which the student has indicated possible deficiencies. The major professor will inform the student no less than three weeks prior to the examination what courses have been selected. However, it is the student's responsibility to secure this information from the major professor.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Degree requirements for non-thesis option

Distribution of credits

Core requirements: 15 credits

Research or project requirements: 4 credits

Elective requirements: 13 credits

Total credits: 32

No more than 9 credits may be taken at the 400/500 level.

Core requirements

- ME 673 Applied Engineering Analysis I **Credits: (3-0) 3**
- ME 773 Applied Engineering Analysis II **Credits: (3-0) 3**

Students should also select one course from each of the three areas listed below (or approved substitutions) for a total of five core courses. The details of the actual course selections must be developed by the student, the student's academic advisor, and the student's committee.

Thermal Sciences

- ME 612 Transport Phenomena: Momentum **Credits: (3-0) 3**
- ME 613 Transport Phenomena: Heat **Credits: (3-0) 3**
- ME 616 Computations in Transport Phenomena **Credits: (3-0) 3**
- ME 618 Conduction Heat Transfer **Credits: (3-0) 3**
- ME 619 Convection Heat Transfer **Credits: (3-0) 3**
- ME 620 Radiation Heat Transfer **Credits: (3-0) 3**

Mechanical Systems

- ME 623 Advanced Mechanical Vibrations **Credits: (3-0) 3**
- ME 680 Advanced Strength of Materials **Credits: (3-0) 3**
- ME 713 Advanced Solid Mechanics I **Credits: (3-0) 3**
- ME 770 Continuum Mechanics **Credits: (3-0) 3**

Manufacturing and Controls

- ME 683 Advanced Mechanical System Control **Credits: (3-0) 3**
- ME 781 Robotics **Credits: (3-0) 3**
- ME 625 Smart Structures **Credits: (3-0) 3**

Research or project requirements

The completion of a master's project, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- ME 788 Master's Research Problems/Projects **Credits: Credit to be arranged. ****
** At least 4 credits of ME 788 are required. No more than 4 credits of ME 788 may be counted toward the degree.

Elective requirements

All electives must be approved by the student's advisor or advisory committee.

Examinations

Mechanical engineering MS graduate students selecting a non-thesis option will be required to pursue a special investigation under the direction of a faculty member. The report on this study will be written and formal although not of thesis quality nor extent. Upon the completion of the special investigation and with the approval of the directing faculty member, the student will be given a formal oral examination over the investigation. Rules concerning an oral examination over coursework taken by the student in their graduate program will be identical to the rules stipulated above for those students taking the thesis option.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Mining Engineering and Management, MS

Contact Information

Dr. Purushotham Tukkaraja, Program Coordinator

Mining Engineering and Management Department

MI 229

(605) 394-1267

E-mail: Purushotham.Tukkaraja@sdsmt.edu

MS in Mining Engineering and Management

The Master of Science in Mining Engineering and Management provides both a thesis and a non-thesis option. Within each option, either a technical track or a management track may be followed. The course delivery is geared towards both campus and hybrid-distance delivery modes.

SD Mines students accepted to the Accelerated MS option may apply up to 9 credits of 500/600 level MEM credits taken as an undergraduate toward both the BS and the MS degrees.

Degree requirements for thesis option

Distribution of credits

Core requirements: 9-12 credits

Research or project requirements: 6-12 credits

Elective requirements: 9-15 credits

Total credits: 30

A minimum of 15 credits of the 30 required must be taken at the 600 level or above.

Core requirements

Core courses must be taken at the 500 level or above.

- A minimum of 6 credits with an MEM prefix, chosen from either a technical track or a management track (refer to the Mining Engineering and Management MS program handbook for course lists)
- MEM 501 Fundamentals of the Mineral Industry **Credits: (3-0) 3 ***
- MEM 700 Developing and Planning Research **Credits: (1-0) 1**
- MEM 790 Seminar **Credits: (2-0) 2**

* Students entering the program with a bachelor's degree in an engineering field outside of mining engineering, or with a bachelor's degree in geology and fewer than 3 years of mining industry experience, must take this course. In addition, students entering the program with a bachelor's degree in an area other than engineering or geology and who have fewer than 8 years of mining industry experience must take this course.

Research or project requirements

The completion of a master's thesis, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- **MEM 798 Thesis Credits: To be arranged ****
** At least 6 credits of MEM 798 are required. No more than 12 credits of MEM 798 may be counted toward the degree.

Elective requirements

- Six (6) credits of courses with an MEM prefix
- An additional 4-6 credits of courses with an MEM, ENGM, CEM, or IENG prefix

Electives must be taken at the 500, 600, or 700 level. Students may petition the program to allow electives of courses at the 400 level or with different prefixes than listed above. All electives are subject to approval by the student's graduate advisory committee.

Examinations

A thesis defense and a thesis proposal defense is required for this degree. For more information, see the Mining Engineering and Management Handbook.

Additional requirements

A maximum of 9 credit hours may be transferred from another accredited institution (400 level or above).

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Degree requirements for non-thesis option

Distribution of credits

Core requirements: 11-14 credits

Research or project requirements: 0 credits

Elective requirements: 18-21 credits

Total credits: 32

A minimum of 16 credits of the 32 required must be taken at the 600 level or above.

Core requirements

Core courses must be taken at the 500 level or above.

- A minimum of 9 credits with an MEM prefix, chosen from either a technical track or a management track (refer to the Mining Engineering and Management MS program handbook)
- MEM 501 Fundamentals of the Mineral Industry **Credits: (3-0) 3 ***
- MEM 790 Seminar **Credits: (2-0) 2**

* Students entering the program with a bachelor's degree in an engineering field outside of mining engineering, or with a bachelor's degree in geology and fewer than 3 years of mining industry experience, must take this course. In addition, students entering the program with a bachelor's degree in an area other than engineering or geology and who have fewer than 8 years of mining industry experience must take this course.

Research or project requirements

No project is required or permitted for this degree.

Elective requirements

- Six (6) credits of courses with an MEM prefix
- An additional 12-15 credits of courses with an MEM, ENGM, CEM, or IENG prefix

Electives must be taken at the 500, 600, or 700 level. Students may petition the program to allow electives of courses at the 400 level or with different prefixes than listed above. All electives are subject to approval by the student's graduate advisor.

Examinations

No final degree examination is required for the non-thesis option. Individual courses may hold final examinations as part of the course.

Additional requirements

A maximum of 9 credit hours may be transferred from another accredited institution (400 level or above).

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Paleontology, MS

Contact Information

Dr. Laurie Anderson, Department Head

Department of Geology and Geological Engineering

Mineral Industries 303

(605) 394-2461

E-mail: Laurie.Anderson@sdsmt.edu.

MS in Paleontology

The MS in Paleontology is only offered with a thesis option.

SD Mines students accepted to the Accelerated MS option may apply up to 9 credits of 500/600 level courses taken as an undergraduate toward both the BS and the MS degrees.

For more information on this degree see the Department of Geology and Geological Engineering page under the Graduate Programs Listing in this catalog.

Degree requirements for thesis option

Distribution of credits

Core requirements: 6-7 credits

Research requirements: 6 credits

Elective requirements: 17-18 credits

Total credits: 30

A minimum of 15 credits of the 30 required must be taken at the 600 level or above.

Core requirements

- GEOL 700 Developing and Planning Research **Credits: (1-0) 1 ***
- GEOL 771/771L Paleobiology/Lab **Credits: (3-1) 4**
- GEOL 471/571 Field Paleontology **Credits: (0-2) 2**
- **OR**
- GEOL 604 Advanced Field Geology **Credits: (0-3) 3**

*Required in the first fall semester of enrollment.

Research requirements

The completion of a master's thesis, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- **PALE 798 Thesis Credits: Credit to be arranged.**
*At least 6 credits of PALE 798 are required. No more than 6 credits of PALE 798 may be counted toward the degree.

Elective requirements

Candidates will work with their advisor and committee members to develop an approved program of study to fulfill the remaining coursework requirements.

- At least 17-18 elective credits

Examinations

Candidates for the MS degree must fulfill all degree requirements of the graduate office and of the program. Departmental requirements include a written thesis proposal with oral proposal defense and an oral comprehensive exam covering course material.

The thesis proposal and its defense will be scheduled through the student's major advisor and will have the thesis committee's approval. A final thesis proposal, which may require revisions following the thesis proposal defense, serves as a contract of expectations for the student's thesis. The thesis proposal defense must take place at least six months prior to the thesis defense. Students must declare any non-disclosure agreements and associated materials or information as an addendum to the thesis proposal document.

The oral comprehensive exam should be scheduled through the student's major advisor with committee approval when the student has substantially completed the required 24 credits of coursework for the MS; the exam must be held at least three months prior to the thesis defense.

Additional requirements

Any physical specimens (and associated documentation) collected, prepared, and cited in a thesis or dissertation are to be deposited in the Museum of Geology as part of the student's work. Guidelines (available only via on-campus or VPN connection) and forms are available online.

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Physics, MS

Contact Information

Dr. R. Oszwaldowski, Graduate Program Coordinator

Department of Physics

Electrical Engineering/Physics 119

(605) 394-2726

E-mail: Rafal.Oszwaldowski@sdsmt.edu

MS in Physics

The MS in Physics is a collaborative program between the University of South Dakota and South Dakota School of Mines & Technology. It includes a thesis and a non-thesis option. The thesis option requires a thesis based on research, while the non-thesis option substitutes additional coursework and a research paper/project for the thesis requirement.

The Accelerated MS option is not available for this degree.

Degree requirements for thesis option

Distribution of credits

Core requirements: 19 credits

Research or project requirements: 7 credits

Elective requirements: 6 credits

Total credits: 32

Board of Regents policy states that a minimum of 16 credits of the 32 required must be taken at the 600 level or above. Students who complete the Physics core described below will automatically fulfill this requirement.

Core requirements

- PHYS 721 Electrodynamics I **Credits: (3-0) 3**
- PHYS 723 Electrodynamics II **Credits: (3-0) 3**
- PHYS 743 Statistical Mechanics **Credits: (3-0) 3**
- PHYS 751 Classical Mechanics **Credits: (3-0) 3**
- PHYS 771 Quantum Mechanics I **Credits: (3-0) 3**
- PHYS 773 Quantum Mechanics II **Credits: (3-0) 3**
- PHYS 790 Seminar **Credits: 1 to 3 ***

* One (1) credit of PHYS 790 is required.

Research or project requirements

The completion of a master's thesis, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- **PHYS 798 Thesis Credits: 1 to 9 ****

** At least 7 credits of 798 are required. No more than 7 credits of PHYS 798 may be counted toward the degree.

Elective requirements

All elective courses must be approved by the student's graduate advisor. Electives may be chosen from the list below. At least 6 credits of approved electives must be earned.

- **PHYS 433/533 Nuclear and Elementary Particle Physics Credits: (3-0) 3**
- **PHYS 439/539 Condensed Matter Physics Credits: 3 to 4 credits**
- **PHYS 481/581 Mathematical Physics Credits: 3 to 4 credits**
- **MES 603 Condensed Matter Physics Credits: (4-0) 4**
- **PHYS 683 Mathematical Physics II Credits: (3-0) 3**
- **PHYS 691 Independent Study Credits: 1 to 3**
- **PHYS 692 Topics Credits: 1 to 3**
- **PHYS 739 Condensed Matter Physics I Credits: (3-0) 3**
- **PHYS 749 Condensed Matter Physics II Credits: (3-0) 3**
- **PHYS 761 Nuclear and Particle Physics Credits: (3-0) 3**
- **PHYS 763 Advanced Particle Physics Credits: (3-0) 3**
- **PHYS 764 Physics of Neutrinos Credits: (3-0) 3**
- **PHYS 765 Advanced Nuclear Physics Credits: (3-0) 3**
- **PHYS 775 General Relativity Credits: (3-0) 3**
- **PHYS 777 Introduction to Quantum Information Credits: (3-0) 3**
- **PHYS 779 Group Theory Credits: (3-0) 3**
- **PHYS 783 Quantum Field Theory Credits: (3-0) 3**
- **PHYS 784 Advanced Quantum Field Theory Credits: (3-0) 3**
- **PHYS 785 Astrophysics and Cosmology Credits: (3-0) 3**
- **PHYS 786 Nuclear Astrophysics and the Origin of the Elements Credits: (3-0) 3**
- **PHYS 791 Independent Study Credits: 1 to 3**
- **PHYS 792 Topics Credits: 1 to 3**

Examinations

A thesis defense and an oral final examination are required for this degree.

Detailed policy is given in the physics graduate handbook.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Degree requirements for non-thesis option

Distribution of credits

Core requirements: 19 credits

Research or project requirements: 2 credits

Elective requirements: 11 credits

Total credits: 32

Board of Regents policy states that a minimum of 16 credits of the 32 required must be taken at the 600 level or above. Students who complete the Physics core described below will automatically fulfill this requirement.

Core requirements

- PHYS 721 Electrodynamics I **Credits: (3-0) 3**
- PHYS 723 Electrodynamics II **Credits: (3-0) 3**
- PHYS 743 Statistical Mechanics **Credits: (3-0) 3**
- PHYS 751 Classical Mechanics **Credits: (3-0) 3**
- PHYS 771 Quantum Mechanics I **Credits: (3-0) 3**
- PHYS 773 Quantum Mechanics II **Credits: (3-0) 3**
- PHYS 790 Seminar **Credits: 1 to 3 ***

* One (1) credit of PHYS 790 is required.

Research or project requirements

The completion of a master's project is required for this degree.

- PHYS 788 Master's Research Problems/Projects **Credits: 1-5 ****

** At SD Mines, physics students normally complete the thesis option, and PHYS 788 is not offered. Students considering the non-thesis option should consult with their advisor/major professor about an appropriate substitution for 788.

Elective requirements

All elective courses must be approved by the student's graduate advisor. Electives may be chosen from the list below.

- PHYS 433/533 Nuclear and Elementary Particle Physics **Credits: (3-0) 3**
- PHYS 439/539 Condensed Matter Physics **Credits: 3 to 4 credits**
- PHYS 481/581 Mathematical Physics **Credits: 3 to 4 credits**
- MES 603 Condensed Matter Physics **Credits: (4-0) 4**
- PHYS 683 Mathematical Physics II **Credits: (3-0) 3**
- PHYS 691 Independent Study **Credits: 1 to 3**
- PHYS 692 Topics **Credits: 1 to 3**
- PHYS 739 Condensed Matter Physics I **Credits: (3-0) 3**
- PHYS 749 Condensed Matter Physics II **Credits: (3-0) 3**
- PHYS 761 Nuclear and Particle Physics **Credits: (3-0) 3**
- PHYS 763 Advanced Particle Physics **Credits: (3-0) 3**
- PHYS 764 Physics of Neutrinos **Credits: (3-0) 3**

- PHYS 765 Advanced Nuclear Physics **Credits: (3-0) 3**
- PHYS 775 General Relativity **Credits: (3-0) 3**
- PHYS 777 Introduction to Quantum Information **Credits: (3-0) 3**
- PHYS 779 Group Theory **Credits: (3-0) 3**
- PHYS 783 Quantum Field Theory **Credits: (3-0) 3**
- PHYS 784 Advanced Quantum Field Theory **Credits: (3-0) 3**
- PHYS 785 Astrophysics and Cosmology **Credits: (3-0) 3**
- PHYS 786 Nuclear Astrophysics and the Origin of the Elements **Credits: (3-0) 3**
- PHYS 791 Independent Study **Credits: 1 to 3**
- PHYS 792 Topics **Credits: 1 to 3**

Examinations

No final degree examination is required for the non-thesis option. Individual courses may hold final examinations as part of the course.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Nanoscience and Nanoengineering, MS

Contact Information

Dr. Steve Smith

Nanoscience and Nanoengineering

(605) 394-5268

E-mail: Steve.Smith@sdsmt.edu

<http://nano.sdsmt.edu>

MS in Nanoscience and Nanoengineering

Nanoscience and Nanoengineering refer to fields of science and engineering with a focus on visualizing, manipulating and delineating the laws governing all phases of matter on the scale of one billionth of a meter, roughly one hundred thousandth the diameter of a human hair. Nanotechnology refers to the specific technologies enabled by Nanoscience and Nanoengineering. The Nanoscience and Nanoengineering (Nano SE) MS program complements the Nanoscience and Nanoengineering PhD, with an emphasis on visualizing, manipulating and understanding nano-scale materials, nano-bio systems, and phenomena which define nanotechnology. The MS in Nanoscience and Nanoengineering and is available with a non-thesis option only.

The Accelerated MS option is not available for this degree.

Degree requirements for non-thesis option

Distribution of credits

Core requirements: 16 credits

Research or project requirements: 2 credits

Elective requirements: 12 credits

Total credits: 30

A minimum of 15 credits of the 30 required must be taken at the 600 level or above.

Core requirements

- NANO 504 Nanophotonics **Credits: (3-0) 3**
- NANO 701 Nano Materials **Credits: (3-0) 3**
- NANO 702 Theory and Application of Nanoscale Materials **Credits: (3-0) 3**
- NANO 703/703L Instrumentation and Characterization of Nano-Materials/Lab **Credits: (3-1) 4**
- NANO 709 Scientific Instrumentation, Control, and Visualization **Credits: (3-0) 3**

Research or project requirements

The completion of a master's research project is required for this degree.

- NANO 788 Master's Research Problems/Project **Credits: 1 to 2 ***
* At least 2 credits of NANO 788 are required. No more than 2 credits of NANO 788 may be counted toward the degree.

Elective requirements

- At least 12 credits of 500/600/700 level courses approved by the student's advisory committee

Examples of electives are given below (see the SD Mines catalog for a full list):

- NANO 604 Nanophotonic Materials **Credits: (3-0) 3**
- NANO 704 Crystallography and Structure of Nanomaterials **Credits: (3-0) 3**
- NANO 705 Nanoelectronics **Credits: (3-0) 3**
- NANO 715 Polymeric Nanomaterials **Credits: (3-0) 3**
- NANO 717 Nanochemistry **Credits: (3-0) 3**
- NANO 719 Nanomaterials for Biosensors **Credits: (3-0) 3**
- NANO 792 Topics **Credits: 1 to 3**

Examinations

No final degree examination is required for the non-thesis option. Individual courses may hold final examinations as part of the course.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Doctor of Philosophy

Atmospheric and Environmental Sciences, PhD

Contact Information

Dr. William J. Capehart, Program Director

Mineral Industries 213

(605) 394-1994

E-mail: William.Capehart@sdsmt.edu

PhD in Atmospheric and Environmental Sciences

The Atmospheric and Environmental Sciences PhD program links expertise in atmospheric and environmental science, biogeochemistry, geology, hydrology, water quality and water resources to address regional and local issues that may also be nationally or globally significant. The fundamental objective lies in developing the ability to address linkages between earth system components and land management practices in a way that benefits decision-making at regional and national levels.

Degree requirements

Distribution of credits

Core requirements: 4 credits

Research requirements: 36 credits

Elective requirements: 32 credits

Total credits: 72

At least 36 of the required 72 credits must be taken at the 600 level or above.

Students may apply 24 coursework credits and 6 research credits from a previous MS degree toward the PhD requirements, subject to approval by the student's committee.

Core requirements

- AES 690 Seminar **Credits: (1-0) 1**
- AES 808 Fundamental Problems in Engineering and Science **Credits: (3-0) 3**

Research requirements

The completion of a doctoral dissertation, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- AES 898 Dissertation **Credits: Credit to be arranged. ***
* A minimum of 36 credits of AES 898 are required for the degree. No more than 36 credits of AES 898 may be counted toward the degree.

Elective requirements

A total of 32 credits of elective courses are required and must include:

- One elective course in measuring and/or modeling techniques
- Additional elective courses selected in consultation with the student committee

Students must complete at least one course in measuring and/or modeling techniques, to be selected by the student's committee. Suitable courses for this requirement are offered in Atmospheric and Environmental Sciences and also programs on campus that include Civil and Environmental Engineering, Geology and Geological Engineering, Chemistry and Applied Biological Sciences, Chemical and Biological Engineering, and Mathematics and Computer Sciences.

All elective courses must be approved by the student's graduate advisory committee. Listed below are examples of courses that might be included as electives in an AES program of study. These lists are intended as examples and are not intended to limit a student and committee as they construct an individual program. Cross-listed 400/500 level coursework must be taken at the 500 level to apply.

- AES 520 Remote Sensing for Research **Credits: (3-0) 3**
- AES 625 Scaling in Geosciences **Credits: (3-0) 3**
- CEE 421/521 Aqueous Geochemistry **Credits: (3-0) 3**
- AES 401/501 Atmospheric Physics **Credits: (3-0) 3**
- AES 403/503 Biogeochemistry **Credits: (3-0) 3**
- AES 405/505 Air Quality **Credits: (3-0) 3**
- AES 406/506 Global Environmental Change **Credits: (3-0) 3**
- AES 419/519 High-Performance Computing in Earth Sciences **Credits: (3-0) 3**
- AES 430/530 Radar Meteorology **Credits: (3-0) 3**
- AES 455/455L/555/555L Synoptic Meteorology II/Lab **Credits: (2-1) 3**
- AES 460/560 Atmospheric Dynamics **Credits: (3-0) 3**
- AES 540 Atmospheric Electricity **Credits: (3-0) 3**
- AES 603 Biosphere-Atmosphere Interactions **Credits: (3-0) 3**
- AES 612 Atmospheric Chemistry **Credits: (3-0) 3**
- AES 615 Earth and Systems Modeling **Credits: (3-0) 3**
- AES 643 Precipitation Physics and Cloud Modification **Credits: (3-0) 3**
- AES 660 Atmospheric Dynamics II **Credits: (3-0) 3**
- AES 692 Topics **Credits: 1 to 3**
- AES 744/744L Numerical Weather & Climate Prediction/Lab **Credits: (2-1) 3**
- AES 770 Boundary Layer Processes **Credits: (3-0) 3**
- AES 773 Mesometeorology **Credits: (3-0) 3**
- AES 775 Applied Freshwater Science **Credits: (3-0) 3**
- AES 780 Stream Ecology **Credits: (1-0) 1**
- CEE 426/526 Environmental Engineering Unit Operations and Processes **Credits: (3-0) 3**
- CEE 427/527 Environmental Engineering Biological Process Design **Credits: (3-0) 3**
- CEE 433/533 Open Channel Flow **Credits: (3-0) 3**
- CEE 634 Surface Water Hydrology **Credits: (3-0) 3**
- GEOE 663/663L Groundwater Geochemistry/Lab **Credits: (2-1) 3**
- GEOE 692 Topics **Credits: 1 to 3**
- GEOE 782/782L Fluvial Processes/Lab **Credits: (2-1) 3**
- GEOL 416/416L/516/516L Introduction to GIS/Lab **Credits: (2-1) 3**
- GEOL 417/517 Geospatial Databases **Credits: (3-0) 3**

- GEOL 419/519 Advanced Geospatial Analysis **Credits: (3-0) 3**
- GEOL 420/520 Introduction to Remote Sensing **Credits: (3-0) 3**
- GEOL 633/633L Sedimentation/Lab **Credits: (2-1) 3**
- GEOL 692 Topics **Credits: 1 to 3**

Examinations

Qualifying examination

A written or oral qualifying exam is used to assess the student's mastery of the graduate coursework. Students who have received an MS degree from SD Mines can waive this requirement.

Comprehensive examination and admission to candidacy

A comprehensive examination is given to evaluate the student's ability to formulate a research problem based on substantive literature review, and to test the student's knowledge in the area of specialty. It is given in two parts: 1) a written examination consisting of a review paper in the student's field of study and a research proposal, and 2) an oral examination to evaluate the research proposal and verify the student's understanding of the basic sciences and specialized field of study. The comprehensive examination, and subsequent admission to candidacy, must be completed at least 12 months before the dissertation is defended.

Dissertation defense

The dissertation forms the final test of the student's ability to perform and communicate research. The student must prepare a doctoral dissertation and successfully complete a public defense covering the scientific validity of the work, as well as the student's basic and specialized knowledge in the field of study.

Additional requirements

There is no language requirement in the AES program. However, all AES students are expected to be proficient in speaking, understanding, and writing the English language.

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Biomedical Engineering, PhD

Contact Information

Dr. Richard Sinden (Program Coordinator)

Department of Chemistry and Applied Biological Sciences
Chemical and Biological Engineering/Chemistry 2206
(605) 394-1678
E-mail: Richard.Sinden@sdsmt.edu

Dr. Grant Crawford (Associate Program Coordinator)

Department of Materials and Metallurgical Engineering
MI 104
(605) 394-5133
Email: Grant.Crawford@sdsmt.edu

PhD in Biomedical Engineering

Offered jointly with University of South Dakota (USD). Courses are offered at both SD Mines and USD campuses.

Degree requirements

Distribution of credits

Core requirements: 21 credits
Research requirements: 36 credits
Elective requirements: 15 credits
Total credits: 72

At least 36 of the required 72 credits must be taken at the 600-level or above.

Students may apply 24 coursework credits and 6 research credits from a previous MS degree toward the PhD requirements, subject to approval by the student's committee.

Core requirements

- BME 601 Biomaterials **Credits: (3-0) 3**
 - BME 602 Anatomy and Physiology for Engineers **Credits: (3-0) 3**
 - BME 603 Molecular Biology for Engineers **Credits: (3-0) 3**
 - BME 408/508 Biomedical Engineering **Credits: (3-0) 3**
 - BME 710 Experimental Design and Data Analysis in Biological Engineering **Credits: (3-0) 3**
 - BME 690 Seminar **Credits: (1-0) 1 ***
OR
 - BME 790 Seminar **Credits: (1-0) 1 ***
- * A minimum of 6 credits of BME 690 or BME 790 are required. No more than 6 credits of BME 690 or BME 790 are recommended for the degree.

Research requirements

The completion of a doctoral dissertation, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree. PhD students are expected to participate in the creation of new knowledge and applications in biomedical engineering.

- BME 898 Dissertation **Credits: Credit to be arranged** **

**At least 36 credits of BME 898 are required. No more than 36 credits of BME 898 may be counted toward the degree.

Elective requirements

Each PhD program of study is individually designed to meet the goals of the student. Courses from a variety of areas, including materials and metallurgical engineering, mechanical engineering, chemistry, electrical and computer engineering, genetics and molecular biology, and mathematics and computer science, may be used to fulfill the elective requirements in a manner intended to complement the student's research. Elective courses in the area of the student's intended research are to be selected in consultation with the student's advisory committee. A list of possible BME electives can be found in the course description section of this catalog.

- Electives with a BME prefix, **6 credits total**
- Additional Electives, **9 credits total**

Examinations

Detailed information on examination policies, admission to candidacy, and defense of dissertation may be found in the Graduate Education section of this catalog and the BME Graduate Handbook.

Qualifying examination

The qualifying exam for the BME PhD involves submission of a Comprehensive Progress Report written in the form of a manuscript and an Appendix that describes future research plans. Students will take a qualifying exam after completing two full semesters of research.

Comprehensive examination and admission to candidacy

In the BME PhD Program a research proposal and oral examination constitute the Comprehensive Examination required by the SD Mines Graduate School. Students must prepare and submit their Research Proposal to their Advisory Committee by the end of their second year in the BME PhD Program. Following successful defense of the oral examination the student may apply for admission to candidacy.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Dissertation defense

A dissertation defense and a final oral examination are required for this degree.

Chemical and Biological Engineering, PhD

Contact Information

Dr. Todd Menkhaus, Program Coordinator

Department of Chemical and Biological Engineering

(605) 394-2422 Dept: (605) 394-2421

E-mail: Todd.Menkhaus@sdsmt.edu

<http://www.sdsmt.edu/CBE/>

PhD in Chemical and Biological Engineering

The curriculum is designed to provide the CBE PhD graduate with the depth and breadth of engineering knowledge to become a leader in their chosen focus area. To facilitate this, each student is asked to complete a program of study plan that will provide the framework for the student's coursework and research. This should be filed with the Program Coordinator before the midterm of the second semester in residence. The CBE PhD Advisory Council must approve all programs of study.

Degree requirements

Distribution of credits

Core requirements: 28 credits

Research requirements: 32 credits

Elective requirements: 12 credits

Total credits: 72

Students entering with a MS degree in Chemical Engineering or a closely related discipline may apply 24 coursework credits and 6 research credits from a previous MS degree toward the PhD requirements, subject to approval of the CBE PhD Program Advisory Council.

Students pursuing a PhD in Chemical and Biological Engineering must take the 500 and above level courses, not the 400 level courses. At least 36 of the required 72 credits must be taken at the 600 level or above.

Core requirements

- A minimum of 6 credits from the Chemical Engineering focus area course list.
- A minimum of 6 credits from the Biological Engineering focus area course list.
- An additional 12 credits from either focus area list.
- **CBE 890 Seminar Credits: (1-0) 1 ***
* Four (4) credits of CBE 890, spread over four semesters, are required. No more than 4 credits of CBE 890 may be applied to the degree.

Focus Area - Chemical Engineering

- CBE 444/544 Reactor Design **Credits: (3-0) 3**
- CBE 605 Applied Engineering Mathematics **Credits: (3-0) 3**
- CBE 611 Chemical Engineering Transport Phenomena **Credits: (3-0) 3**
- CBE 612 Transport Phenomena: Momentum **Credits: (3-0) 3**
- CBE 613 Transport Phenomena: Heat **Credits: (3-0) 3**
- CBE 616 Computations in Transport Phenomena **Credits: (3-0) 3**
- CBE 621 Advanced Chemical Engineering Thermodynamics I **Credits: (3-0) 3**
- CBE 714 Transport Phenomena: Mass **Credits: (3-0) 3**
- CBE 728 Heterogeneous Kinetics **Credits: (3-0) 3**

Focus Area - Biological Engineering

- CBE 484/584 Fundamentals of Biochemical Engineering **Credits: (3-0) 3**
- CBE 484L/584L Biochemical Engineering Laboratory **Credits: (0-1) 1**
- CBE 603 Molecular Biology for Engineers **Credits: (3-0) 3**
- CBE 735 Bioseparations **Credits: (3-0) 3**
- CBE 741 Microbial and Enzymatic Processing **Credits: (3-0) 3**

Research requirements

The completion of a doctoral dissertation, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- CBE 898D Dissertation **Credits: 1 to 12 ***
* A minimum of 32 credits of CBE 898 is required for this degree. No more than 32 credits of CBE 898 may be counted toward the degree.

Elective requirements

Elective courses may be selected from the two focus area lists, from the example elective list, or from other SD Mines courses as a part of a student's program of study, subject to approval of his/her major professor and graduate committee. Examples of elective courses include:

- CBE 424/524 Molecular Modeling and Simulation **Credits: (3-0) 3**
- CBE 434/534 Design of Separation Processes **Credits: (1-0) 1**
- CBE 434L/534L Design of Separation Processes Laboratory **Credits: (0-1) 1**
- CBE 445/545 Oxidation and Corrosion of Metals **Credits: (3-0) 3**
- CBE 450/550 Systems Analysis Applied to Chemical Engineering **Credits: 2 to 3**
- CBE 455/555 Pollution Phenomena and Process Design **Credits: (3-0) 3**
- CBE 474/574 Polymer Technology **Credits: 2 to 3**
- CBE 474L/574L Experimental Polymer Technology **Credits: (0-1) 1**
- CBE 475/575 Advances in Processing and Nanoengineering of Polymers **Credits: (2-0) 2**
- CBE 476/576 Organosilicon Polymer Chemistry and Technology **Credits: (1-0) 1**
- CBE 482/582 Upstream Oil and Gas Processing **Credits: 1 or 3**
- CBE 483/583 Petroleum Refining **Credits: 2 or 3**
- CBE 485/585 Renewable and Sustainable Energy **Credits: (3-0) 3**

- CBE 485L/585L Renewable and Sustainable Energy Lab **Credits: (0-1) 1**
- CBE 486/586 Immuno-Engineering **Credits: 2 or 3**
- CBE 488/588 Applied Design of Experiments for the Chemical Industry **Credits: (2-0) 2**
- CBE 489/589 Composites Manufacturing **Credits: (1-0) 1**
- CBE 742 Applied Electrochemistry **Credits: (3-0) 3**
- CBE 791 Independent Study **Credits: 1 to 4**
- CBE 792 Topics **Credits: 1 to 4**
- CBE 890 Seminar **Credits: (1-0) 1**
- CBE 894 Internship **Credits: 1 to 6**
- CHEM 482/582 Environmental Chemistry **Credits: (3-0) 3**
- MES 712 Interfacial Phenomena **Credits: (3-0) 3**
- NANO 701 Nano Materials **Credits: (3-0) 3**
- ENGM 435/535 Optimization Techniques **Credits: (3-0) 3**
- ENGM 621 Statistical Process Control **Credits: (3-0) 3**

Examinations

Detailed information on examination policy, admission to candidacy, and defense of dissertation are included in the Chemical and Biological Engineering PhD Program Handbook.

Qualifying examination

A written examination consisting of three core subject exams (transport phenomena, chemical reaction engineering, and thermodynamics) is required. The written examinations are given in early January and late May of each year. Incoming PhD graduate students should take the written examinations as soon as possible, but are expected to take the exams after two long sessions in residence (Fall and Spring semesters). Additional details on the written examination may be found in the Chemical and Biological Engineering PhD Program Handbook.

Comprehensive examination and admission to candidacy

Within the first 24 months of residency within the CBE PhD program, students must write a research proposal and complete an oral presentation of that proposal in the presence of their major advisor(s) and their PhD committee. Additional details on the written research proposal and oral presentation may be found in the Chemical and Biological Engineering PhD Program Handbook.

Successful completion of the written examination, written research proposal, and oral presentation are required for admission to candidacy within the CBE PhD program. The comprehensive examination, and subsequent admission to candidacy, must be completed at least 12 months before the dissertation is defended.

Dissertation defense

A dissertation defense and a final oral examination are required for this degree.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Civil and Environmental Engineering, PhD

Contact Information

Dr. James Stone, PhD Graduate Coordinator

Department of Civil and Environmental Engineering
CM 314

Phone: (605) 394-2443

E-mail: James.Stone@sdsmt.edu

PhD in Civil and Environmental Engineering

The Department of Civil and Environmental Engineering offers a PhD degree in civil and environmental engineering (PhD CENE) in the following emphasis areas: environmental, water resources, geotechnical/materials, and structural engineering. This PhD program is a collaboration with South Dakota State University.

Degree requirements

Distribution of credits

Core requirements: 8-9 credits

Research requirements: 21-33 credits

Elective requirements: 30-43 credits

Total credits: 72

At least 36 of the required 72 credits must be taken at the 600-level or above.

Students entering with an MS degree in Civil or Environmental Engineering or a closely related discipline may apply 24 coursework credits and 6 research credits from a previous MS degree toward the PhD requirements, subject to approval by the student's committee.

Core requirements

- MATH 447/547 Design of Experiments **Credits: (3-0) 3**
OR
- CBE 488/588 Applied Design of Experiments for the Chemical Industry **Credits: (2-0) 2**
- CEE 808 Fundamental Problems in Engineering and Science **Credits: (3-0) 3**
- CEE 790 Seminar **Credits: (1-0) ***

* Course taken for credit 3 times for a total of 3 credits.

Research requirements

The completion of a doctoral dissertation, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree. The dissertation is expected to advance knowledge and demonstrate the candidate's technical mastery of the field of study. The research results are expected to be of publishable quality. The student's major advisor may specifically require submission and/or publication of one or more peer-reviewed journal articles.

- CEE 898D Dissertation **Credits: 1 to 12** **

**A minimum of 21 credits of CEE 898 is required. No more than 33 credits of CEE 898 may be counted toward the degree.

Elective requirements

The student's graduate advisory committee will assess the student's academic transcripts and approve elective coursework that, with the core requirements and dissertation credits, meets all degree requirements.

- At least 30 credit hours and a maximum of 43 credit hours of elective courses.
- At least 20 credit hours of graduate level courses with the CEE prefix.
- At least 18 credit hours of graduate level courses at the 600-level or higher.

For additional information regarding elective courses for each area of emphasis refer to the CENE PhD Handbook at www.sdsmt.edu/Academics/Departments/Civil-and-Environmental-Engineering/Curriculum-and-Checklists/.

Examinations

For additional information regarding exams and dissertation requirements refer to the CENE PhD Handbook at www.sdsmt.edu/Academics/Departments/Civil-and-Environmental-Engineering/Curriculum-and-Checklists/.

Qualifying examination

All CENE PhD students must pass a qualifying examination, normally to be taken within the first two semesters of enrollment, or the semester after all background course requirements have been completed. The "Qualifying Exam" is a course-work based exam to test and demonstrate the doctoral student's proficiency in the foundational material of his or her discipline.

Comprehensive examination and admission to candidacy

A comprehensive examination is given to evaluate the student's ability to formulate a research problem based on substantive literature review, and to test the student's knowledge in their area of specialty. The exam is given in two parts: 1) a written proposal describing the dissertation topic/problem and a research plan for addressing the problem, and 2) a written and/or oral examination to evaluate the student's ability to perform research and to demonstrate the student's knowledge in their specialized field of study.

Dissertation defense

The dissertation is the culminating evidence of the student's ability to perform and communicate research. The student must prepare a doctoral dissertation and successfully complete a public defense demonstrating the scientific validity of the work, as well as the student's basic and specialized knowledge in the field of study.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Geology, Geological Engineering, and Mining Engineering, PhD

Contact Information

Dr. Laurie Anderson, Department Head

Department of Geology and Geological Engineering
Mineral Industries 303
(605) 394-2461
E-mail: Laurie.Anderson@sdsmt.edu

Dr. Lance Roberts, Department Head

Department of Mining Engineering and Management
Mineral Industries 235B
(605) 394-2344
E-mail: Lance.Roberts@sdsmt.edu

PhD in Geology, Geological Engineering, and Mining Engineering

Students must elect to pursue a specialization in Geology, Geological Engineering, or Mining Engineering. Each specialization has different background and program requirements. For more information see the graduate programs pages for the Departments of Geology and Geological Engineering and the Department of Mining Engineering and Management.

Degree requirements

Distribution of credits

Geology Specialization and Geological Engineering Specialization

Core requirements: 4 credits
Research requirements: 20-36 credits
Elective requirements: 32-48 credits
Total credits: 72

Mining Engineering Specialization

Core requirements: 3 credits
Research or project requirements: 20-36 credits
Elective requirements: 33-49 credits
Total credits: 72

For all three specializations, at least 36 of the required 72 credits must be taken at the 600-level or above.

Students may apply 24 coursework credits and 6 research credits from a previous MS degree toward the PhD requirements, subject to approval by the student's committee.

Core requirements

In the first fall semester of enrollment, students in the Geology Specialization must take:

- GEOL 700 Developing and Planning Research **Credits: (1-0) 1**

In the first fall semester of enrollment, students in the Geological Engineering Specialization must take:

- GEOE 700 Developing and Planning Research **Credits: (1-0) 1**

Students in all three specializations must take:

- GEOL 808 Fundamental Problems in Engineering and Science **Credits: (3-0) 3**

Research requirements

The completion of a doctoral dissertation, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- GEOL 898, GEOE 898, or MEM 898D Dissertation **Credit to be arranged***

*At least 36 credits of 898 are required for the degree. No more than 36 credits of 898 may be counted toward the degree.

Elective requirements

The candidate's committee is responsible for assisting the student in developing a program of study that prepares the student for his/her intended field as well as provides general knowledge for the discipline.

Geology Specialization

A total of 32 elective credits are required, including courses determined by the student's advising committee to meet the following objectives:

- one GEOL/GEOE course emphasizing field methods
- one GEOL/GEOE course emphasizing analytical methods
- one GEOL/GEOE course emphasizing computational methods

It is recommended that six (6) to twelve (12) hours of coursework be taken outside the Department of Geology and Geological Engineering.

Geological Engineering Specialization

All PhD students in the Geological Engineering specialization are expected to focus in one of the three areas of groundwater/environmental, geomechanics, or energy/mineral resources. A total of 32 elective credits are required, including courses determined by the student's advising committee to meet the following objectives:

- one GEOL/GEOE course emphasizing field methods
- one GEOL/GEOE course emphasizing analytical methods
- one GEOL/GEOE course emphasizing computational methods

It is recommended that six (6) to twelve (12) hours of coursework be taken outside the Department of Geology and Geological Engineering.

Mining Engineering Specialization

A total of 33 elective credits are required, including:

- At least 15 credits of electives with an MEM prefix
- At least 21 credits of additional MEM or other electives

Examinations

When the student has substantially completed the required 36 credits of coursework for the PhD, and before work on the dissertation research commences in earnest, the student must complete a combined examination composed of two parts: a qualifying examination and a comprehensive examination. After successful completion of both exams, the student will be admitted to PhD candidacy. Detailed information on both examinations is outlined in the Geology and Geological Engineering Graduate Handbook (available only via on-campus or VPN connection), The Mining Engineering Graduate Handbook, and in the Graduate Education Policies GEP VIII. Ph.D. Degree Requirements.

If the student has not completed all requirements for the PhD degree by the fifth year following the comprehensive examination, his/her active candidacy status will be automatically terminated and the comprehensive examination must be repeated.

Qualifying examination

The qualifying examination will consist of a written examination covering the student's field of study and related subjects.

Comprehensive examination and admission to candidacy

The comprehensive examination consists of the oral presentation and defense of the student's dissertation research proposal. All PhD students are required to prepare a research proposal for the research to be accomplished for the dissertation.

Dissertation defense

A dissertation defense and a final oral examination are required for this degree. The final defense must take place no earlier than 12 months after admission to candidacy.

Additional requirements

For the Geology and Geological Engineering specializations, any physical specimens (and associated documentation) collected, prepared, and cited in a thesis or dissertation are to be deposited in the Museum of Geology as part of the student's work. Guidelines (available only via on-campus or VPN connection) and forms are available.

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Materials Engineering and Science, PhD

Contact Information

Dr. Jon J. Kellar

Department of Materials and Metallurgical Engineering
Mineral Industries 112
(605) 394-2343
E-mail: Jon.Kellar@sdsmt.edu

PhD in Materials Engineering and Science

The doctor of philosophy program in Materials Engineering and Science (MES) offers a student the opportunity to expand his/her knowledge and understanding of the science and technology of materials production, behavior, and applications. Candidates will study either a science or an engineering emphasis within the MES Ph.D. program.

Degree requirements

Distribution of credits

Core requirements: 7-8 credits
Research or project requirements: 22 credits
Elective requirements: 42-43 credits
Total credits: 72

At least 36 of the required 72 credits must be taken at the 600 level or above.

Students may apply 24 coursework credits and 6 research credits from a previous MS degree toward the PhD requirements, subject to approval by the student's committee.

Core requirements

One course (3-4 credits) in analytical mathematics to be selected from this list:

- ME 673 Applied Engineering Analysis I **Credits: (3-0) 3**
- PHYS 481/581 Mathematical Physics **Credits: 3 to 4 credits**

One course (3 credits) in numerical mathematics to be selected from this list:

- MATH 447/547 Design of Experiments **Credits: (3-0) 3**
- ME 773 Applied Engineering Analysis II **Credits: (3-0) 3**
- MET 614 Advanced Metallurgical Simulation Techniques **Credits: (3-0) 3**
- MEM 433/433L/533/533L Advanced Mine Planning & Design **Credits: (2-1) 3**

One credit of Seminar is required. MS students take MES 790; PhD students take MES 890.

- MES 790/890 Seminar **Credits: (1-0) 1**

Research or project requirements

The completion of a doctoral dissertation, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- MES 898 Dissertation **Credits: Credit to be arranged.** *

* A minimum of 22 credits of MES 898 is required. No more than 22 credits of MES 898 may be counted toward the degree.

Elective requirements

All elective courses must be approved by the student's graduate advisory committee (or advisor). Every student must complete the requirements for either the Materials Science emphasis or the Materials Engineering emphasis.

Materials Science emphasis

One course (3 credits) in thermodynamics of solids to be selected from this list:

- MES 712 Interfacial Phenomena **Credits: (3-0) 3**
- PHYS 743 Statistical Mechanics **Credits: (3-0) 3**
- CBE 613 Transport Phenomena: Heat **Credits: (3-0) 3**
- CBE 714 Transport Phenomena: Mass **Credits: (3-0) 3**
- MES 728 Heterogeneous Kinetics **Credits: (3-0) 3**

One course (3-4 credits) in crystal structure/chemistry of solids to be selected from this list:

- MES 603 Condensed Matter Physics **Credits: (4-0) 4**
- MES 604 Chemistry of Materials **Credits: (4-0) 4**
- PHYS 771 Quantum Mechanics I **Credits: (3-0) 3**

One course (3-4 credits) in bulk or surface analysis to be selected from this list:

- NANO 703/703L Instrumentation and Characterization of Nano-Materials/Lab **Credits: (3-1) 4**
- MES 602/602L Materials Characterization: Methods and Applications/Lab **Credits: (3-0) 3**

Two courses (6 credits) in fundamental engineering mechanics to be selected from this list: (Courses from the Materials Engineering emphasis section can also be used to fulfill this requirement.)

- ME 425 Probabilistic Mechanical Design **Credits: (3-0) 3**
 - MET 450/550 Forensic Engineering **Credits: (3-0) 3**
 - MET 440/540 Mechanical Metallurgy **Credits: (3-0) 3**
 - ME 443 Composite Materials **Credits: (3-0) 3**
- OR**
- MET 443 Composite Materials **Credits: (3-0) 3**
 - MET 625 Strengthening Mechanisms in Metals **Credits: (3-0) 3**

An additional 25-28 credits of course work related to the dissertation, selected in consultation with the student's advisory committee, must be completed.

Materials Engineering emphasis

One course (3 credits) in analytical mechanics to be selected from this list:

- ME 623 Advanced Mechanical Vibrations **Credits: (3-0) 3**
- ME 613 Transport Phenomena: Heat **Credits: (3-0) 3**
- MES 713 Advanced Solid Mechanics I **Credits: (3-0) 3**
- MES 770 Continuum Mechanics **Credits: (3-0) 3**

One course (3 credits) in elasticity/plasticity to be selected from this list:

- CEE 743 Advanced Soil Mechanics **Credits: (3-0) 3**
- MES 713 Advanced Solid Mechanics I **Credits: (3-0) 3**
- MEM 450/550 Rock Slope Engineering **Credits: (3-0) 3**

One course (3 credits) in failure analysis fracture mechanics to be selected from this list:

- ME 715 Advanced Composite Materials **Credits: (3-0) 3**

Two courses (6 credits) in fundamental materials science to be selected from this list: (Courses from the materials science emphasis section can also be used to fulfill this requirement.)

- CHEM 420/520 Organic Chemistry III **Credits: (3-0) 3**
- CHEM 452/552 Inorganic Chemistry **Credits: (3-0) 3**
- CHEM 426/526 Polymer Chemistry **Credits: (3-0) 3**
- MES 603 Condensed Matter Physics **Credits: (4-0) 4**
- MES 601 Fundamentals of Materials Engineering **Credits: (3-0) 3**
- MES 604 Chemistry of Materials **Credits: (4-0) 4**
- CBE 474/574 Polymer Technology **Credits: 2 to 3**
- PHYS 439/539 Condensed Matter Physics **Credits: 3 to 4 credits**
- MET 445/545 Oxidation and Corrosion of Metals **Credits: (3-0) 3**

An additional 27-28 credits of coursework related to the dissertation, selected in consultation with the student's advisory committee, must be completed.

Examinations

Detailed information on examination policy, admission to candidacy, and defense of dissertation is included in the School of Mines Materials Engineering and Science Ph.D. Handbook. The qualifying examination and the comprehensive examination are administered together.

Qualifying examination

An assessment of the student's qualifications will be undertaken early in their program. The assessment is comprised of performance in pre-determined courses (coursework exam).

Comprehensive examination and admission to candidacy

The student is granted admission to candidacy after successfully completing the coursework exam and defending a dissertation research proposal. The comprehensive examination, and subsequent admission to candidacy, should be completed at least 12 months before the dissertation is defended.

Dissertation defense

A dissertation defense and a final oral examination are required for this degree.

Additional requirements

For program supervision purposes, the MES Ph.D. program coordinator is the graduate advisor until the major professor is appointed. The major professor is the person responsible for the student's dissertation research. The graduate office representative on the student's dissertation committee must be selected from outside of the department with which the major professor is affiliated. It is not necessary that the student be associated with the department of affiliation of his or her major professor.

There is no language requirement for the MES doctoral program.

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Mechanical Engineering, PhD

Contact Information

Dr. Pierre Larochelle

Head, Department of Mechanical Engineering
Civil Mechanical Building Room #129
(605) 394-2401
Email: Pierre.Larochelle@sdsmt.edu

Dr. Karim Muci

Professor, Department of Mechanical Engineering
Civil Mechanical Building Room #171
(605) 394-2430
Email: Karim.Muci@sdsmt.edu

Leslee Moore

Senior Secretary
Civil Mechanical Building Room #129
(605) 394 - 2401
Email: Leslee.Moore@sdsmt.edu

PhD in Mechanical Engineering

The mission of the Mechanical Engineering doctoral program is to provide students with advanced learning in the classroom and mentoring to conduct cutting-edge research in the areas of thermo-fluid sciences, mechanical systems, or manufacturing/controls. The primary goal of the program is to develop technical experts that become world-class scholars and leaders in either academia or industry.

Degree requirements

Distribution of credits

Core requirements: 6 credits
Research requirements: 20-36 credits
Elective requirements: 30-46 credits
Total credits: 72

At least 36 of the required 72 credits must be taken at the 600 level or above.

Students may apply 24 coursework credits and 6 research credits from a previous MS degree toward the PhD requirements, subject to approval by the student's committee.

Core requirements

- ME 673 Applied Engineering Analysis I **Credits: (3-0) 3** (Mandatory for all PhD students)
- ME 773 Applied Engineering Analysis II **Credits: (3-0) 3** (Mandatory for all PhD students)

Research requirements

The completion of a doctoral dissertation, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree. All the research credits taken by the PhD student must be ME 898D Dissertation with the exception of 6 research credits which may be transferred from the MS degree with the approval of the student's graduate advisory committee. The 6 MS research credits transferred must be ME 798 or equivalent research credits.

- **ME 898D Dissertation Credits: Credit to be arranged. ***
* A minimum of 20 credits of ME 898 is required for the degree. No more than 36 credits of ME 898 may be counted toward the degree.

Elective requirements

- A minimum of 18 credits selected from the ME electives list below
- An additional 12-28 elective credits (no more than 18 credits may have a prefix other than ME)
- All electives must be approved by the student's graduate advisory committee

ME electives list

Substitution of equivalent courses is allowed with the approval of the student's graduate advisory committee.

- ME 612 Transport Phenomena: Momentum **Credits: (3-0) 3**
- ME 613 Transport Phenomena: Heat **Credits: (3-0) 3**
- ME 616 Computations in Transport Phenomena **Credits: (3-0) 3**
- ME 618 Conduction Heat Transfer **Credits: (3-0) 3**
- ME 619 Convection Heat Transfer **Credits: (3-0) 3**
- ME 620 Radiation Heat Transfer **Credits: (3-0) 3**
- ME 623 Advanced Mechanical Vibrations **Credits: (3-0) 3**
- ME 625 Smart Structures **Credits: (3-0) 3**
- ME 680 Advanced Strength of Materials **Credits: (3-0) 3**
- ME 683 Advanced Mechanical System Control **Credits: (3-0) 3**
- ME 691 Independent Study **Credits: 1 to 3**
- ME 692 Topics **Credits: 1 to 3**
- ME 713 Advanced Solid Mechanics I **Credits: (3-0) 3**
- ME 715 Advanced Composite Materials **Credits: (3-0) 3**
- ME 736 Advanced Finite Element Methods **Credits: (3-0) 3**
- ME 770 Continuum Mechanics **Credits: (3-0) 3**
- ME 781 Robotics **Credits: (3-0) 3**

Examinations

In addition to the successful completion of the curriculum, the program of study requires passing a qualifying exam, submitting a research topic proposal, passing a comprehensive exam, and successfully defending the dissertation.

Qualifying examination

The Qualifying exam tests the student's background knowledge and ability to pursue advanced courses and dissertation research. All students coming into the PhD program are required to take the qualifying exam within the first 12 months of residency. The qualifying exam shall be a written exam, administered by the department's graduate committee, once each semester. All students meeting the time standards for the qualifying exam will take the test at the same time.

Comprehensive examination and admission to candidacy

All students coming into the PhD program with an MS degree are required to complete the comprehensive exam within their first academic year (fall, spring, summer semesters). Students coming into the program with a BS degree must complete the comprehensive exam after their coursework is substantially completed.

The comprehensive exam shall include 1) an oral and written coursework exam; and 2) a proposal defense in which students will be required to write and orally defend their research proposal to their selected advisory committee. Review of the examinations will be accomplished as soon as possible by all members of the committee. Upon completion of the comprehensive examination, the major professor and department head will recommend to the dean of graduate education that the student be admitted to PhD candidacy. The comprehensive examination, and subsequent admission to candidacy, must be completed at least 12 months before the dissertation is defended.

Dissertation defense

A successful dissertation defense and a final oral examination are required for this degree.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Nanoscience and Nanoengineering, PhD

Contact Information

Dr. Steve Smith

Nanoscience and Nanoengineering

(605) 394-5268

E-mail: Steve.Smith@sdsmt.edu

<http://nano.sdsmt.edu>

PhD in Nanoscience and Nanoengineering

Nanoscience and Nanoengineering refer to fields of science and engineering with a focus on visualizing, manipulating and delineating the laws governing all phases of matter on the scale of one billionth of a meter, roughly one hundred thousandth the diameter of a human hair. Nanotechnology refers to the specific technologies enabled by Nanoscience and Nanoengineering. The Nanoscience and Nanoengineering (Nano SE) PhD program offers a research-intensive degree focused on nanoscience and nanoengineering, with an emphasis on visualizing, manipulating and understanding nano-scale materials, nano-bio systems, and phenomena which define nanotechnology.

Degree requirements

Distribution of credits

Core requirements: 13 credits

Research requirements: 30-40 credits

Elective requirements: 27-37 credits

Total credits: 80

At least 40 of the required 80 credits must be taken at the 600 level or above.

Students may apply 24 coursework credits from a previous MS degree in a relevant discipline toward the PhD requirements, subject to approval by the student's committee.

Core requirements

The Nano SE PhD program builds on traditional science and engineering disciplines, and offers a "core" curriculum which introduces students from varying science and engineering backgrounds to contemporary topics in nanoscience and nanoengineering. These "core" courses are intended to introduce students to contemporary topics in nanoscience and nanoengineering, and to initiate a cross-disciplinary approach to research and learning. These courses can usually be completed in one, or at most two years. More information is available in the Nano SE PhD Program Handbook.

- NANO 701 Nano Materials **Credits: (3-0) 3**
- NANO 702 Theory and Application of Nanoscale Materials **Credits: (3-0) 3**
- NANO 703/703L Instrumentation and Characterization of Nano-Materials/Lab **Credits: (3-1) 4**
- NANO 890 Seminar **Credits: (1-0) 1 ***

* Three semesters of seminar are required for a total of 3 credits.

Research requirements

The completion of a doctoral dissertation, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- NANO 898D Dissertation **Credits: Credit to be arranged. ****

**At least 30 credits of NANO 898 are required for the degree. No more than 40 credits of NANO 898 may be applied to the degree.

Elective requirements

Students, after consultation with their advisor, select graduate level electives which provide a framework upon which the PhD is based. Between 27-37 credits of electives are required. The following is a list of currently approved NANO electives. Other graduate level courses approved by the student's graduate committee may also be counted as electives. All courses on the program of study must be approved by the student's graduate advisory committee. More information is available in the Nano SE PhD Program Handbook.

- NANO 401 Introduction to Nanoscience **Credits: (3-0) 3**
- NANO 445/545 Introduction to Nanomaterials **Credits: (3-0) 3**
- NANO 475/575 Advances in Processing and Nanoengineering of Polymers **Credits: (2-0) 2**
- NANO 504 Nanophotonics **Credits: (3-0) 3**
- NANO 551 Classical Mechanics **Credits: (4-0) 4**
- NANO 571 Quantum Mechanics **Credits: (4-0) 4**
- NANO 604 Nanophotonic Materials **Credits: (3-0) 3**
- NANO 704 Crystallography and Structure of Nanomaterials **Credits: (3-0) 3**
- NANO 705 Nanoelectronics **Credits: (3-0) 3**
- NANO 706 Nano-Biotechnology **Credits: (3-0) 3**
- NANO 707 Nanocomposites **Credits: (3-0) 3**
- NANO 708 Nanomaterials for Photovoltaics **Credits: (3-0) 3**
- NANO 709 Scientific Instrumentation, Control, and Visualization **Credits: (3-0) 3**
- NANO 711 Scientific Instrumentation, Control, and Visualization II **Credits: (3-0) 3**
- NANO 712/712L Electromagnetic Properties of Heterogeneous Materials/Lab **Credits: (2-1) 3**
- NANO 714 Fluorescence Spectroscopy **Credits: (3-0) 3**
- NANO 715 Polymeric Nanomaterials **Credits: (3-0) 3**
- NANO 716 Digital Fabrication: Materials and Processes **Credits: (3-0) 3**
- NANO 717 Nanochemistry **Credits: (3-0) 3**
- NANO 719 Nanomaterials for Biosensors **Credits: (3-0) 3**
- NANO 721 Electrodynamics I **Credits: (3-0) 3**
- NANO 736 Advanced Photovoltaics **Credits: (3-0) 3**
- NANO 743 Statistical Mechanics **Credits: (3-0) 3**
- NANO 751 Theoretical Mechanics **Credits: (3-0) 3**
- NANO 771 Quantum Mechanics I **Credits: (3-0) 3**
- NANO 791 Independent Study **Credits: 1 to 3**
- NANO 792 Topics **Credits: 1 to 3**

Examinations

Detailed information on examination policy, admission to candidacy, and defense of dissertation are included in the School of Mines Nano SE PhD Program Handbook.

Qualifying examination

The Nano SE PhD program qualifying examination is a 2 hour written examination covering the Nano SE core courses: NANO 701, 702 and 703. The exam is typically offered at the end of the spring semester. Further information regarding the exam may be found in the Nano SE PhD Program Handbook.

Comprehensive examination and admission to candidacy

Nano SE PhD students submit a written prospectus to their dissertation committee between the second and third year; an oral presentation and examination by the committee follows no earlier than two weeks after submission of the prospectus. Further information regarding the exam may be found in the Nano SE PhD program handbook. The comprehensive examination, and subsequent admission to candidacy, must be completed at least 12 months before the dissertation is defended.

Dissertation defense

A dissertation defense and a final oral examination are required for this degree.

Additional requirements

For program supervision purposes, the Nano SE PhD program director is the graduate advisor until the major professor is appointed. The major professor is responsible for the student's dissertation research. The graduate office representative on the student's dissertation committee must be selected from outside of the department with which the major professor is affiliated, and should not be a member of the Nano PhD Advisory Council.

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Physics, PhD

Contact Information

Dr. R. Oszwaldowski, Graduate Program Coordinator

Department of Physics

Electrical Engineering/Physics 119

(605) 394-2726

E-mail: Rafal.Oszwaldowski@sdsmt.edu

PhD in Physics

The PhD in Physics is a collaborative program between the University of South Dakota and South Dakota School of Mines & Technology.

Degree requirements

Distribution of credits

Core requirements: 24 credits

Research requirements: 36 credits

Elective requirements: 12 credits

Total credits: 72

Board of Regents policy states that a minimum of 36 credits of the required 72 must be taken at the 600 level or above. Students who complete the Physics core and the Research requirements (described below) will automatically fulfill this requirement.

Students may apply 24 coursework credits and 6 research credits from a previous MS degree toward the PhD requirements, subject to approval by the student's committee.

Core requirements

- PHYS 721 Electrodynamics I **Credits: (3-0) 3**
- PHYS 723 Electrodynamics II **Credits: (3-0) 3**
- PHYS 743 Statistical Mechanics **Credits: (3-0) 3**
- PHYS 751 Classical Mechanics **Credits: (3-0) 3**
- PHYS 771 Quantum Mechanics I **Credits: (3-0) 3**
- PHYS 773 Quantum Mechanics II **Credits: (3-0) 3**
- PHYS 761 Nuclear and Particle Physics **Credits: (3-0) 3**
- PHYS 790 Seminar **Credits: 1 to 3 ***

* A total of 3 credits of PHYS 790, taken over up to three semesters, is required. Permission of instructor is required to take more than one credit of PHYS 790 in a given semester.

Research requirements

The completion of a doctoral dissertation, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree.

- **PHYS 898-D Dissertation Credits: 1 to 9 ****

** A minimum of 36 credit hours of PHYS 898 is required for the degree. No more than 36 credits of PHYS 898 may be counted toward the degree.

Elective requirements

All elective courses must be approved by the student's graduate advisor. A total of 12 credit hours of elective courses is required. Courses may be chosen from the following list.

- **PHYS 683 Mathematical Physics II Credits: (3-0) 3**
- **PHYS 691 Independent Study Credits: 1 to 3**
- **PHYS 692 Topics Credits: 1 to 3**
- **PHYS 733 Experimental Particle Physics: Principles, Data Analysis, and Simulation Credits: (3-0) 3**
- **PHYS 739 Condensed Matter Physics I Credits: (3-0) 3**
- **PHYS 749 Condensed Matter Physics II Credits: (3-0) 3**
- **PHYS 763 Advanced Particle Physics Credits: (3-0) 3**
- **PHYS 764 Physics of Neutrinos Credits: (3-0) 3**
- **PHYS 765 Advanced Nuclear Physics Credits: (3-0) 3**
- **PHYS 775 General Relativity Credits: (3-0) 3**
- **PHYS 777 Introduction to Quantum Information Credits: (3-0) 3**
- **PHYS 779 Group Theory Credits: (3-0) 3**
- **PHYS 783 Quantum Field Theory Credits: (3-0) 3**
- **PHYS 784 Advanced Quantum Field Theory Credits: (3-0) 3**
- **PHYS 785 Astrophysics and Cosmology Credits: (3-0) 3**
- **PHYS 786 Nuclear Astrophysics and the Origin of the Elements Credits: (3-0) 3**
- **PHYS 791 Independent Study Credits: 1 to 3**
- **PHYS 792 Topics Credits: 1 to 3**

Examinations

Qualifying examination

All students in the PhD program must pass the qualifying examination, typically after two years of graduate coursework. The examination problems are based on the material covered in the core courses of: Classical Mechanics, Statistical Mechanics, Electrodynamics and Quantum Mechanics.

The examination takes place typically in mid-August.

Detailed policy is given in the physics graduate handbook.

Comprehensive examination and admission to candidacy

All physics PhD students must take comprehensive examination. In these exams, students present their research plans leading to fulfillment of PhD requirements, as well as their preliminary research. Students should be able to argue for the validity of their approach, and the relevance of their project to the broader area of their research.

Detailed policy is given in the physics graduate handbook.

The comprehensive examination, and subsequent admission to candidacy, must be completed at least 12 months before the dissertation is defended.

Dissertation defense

A dissertation defense and a final oral examination are required for this degree.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Minors

Minors - General Information

Students interested in pursuing a specific minor offered by SDSM&T should contact the coordinator of that minor for more specific information on the application process and the appropriate forms.

- No undergraduate degree program requires a minor.
- Regental undergraduate minors consist of 18-24 semester credit hours.
- No fewer than 50% semester credit hours in a minor must be taken at School of Mines.
- A cumulative grade point average of 2.00 or better must be attained in the coursework defining the minor.
- The specific courses required for a minor in each department and program offering a minor can be found in the section of this catalog where that program is described.
- Notification of intent to seek a minor is to be in effect no later than the time of registration for the first semester of the senior year (90 or more credit hours completed) on a form available in the Registrar and Academic Services (RAS) office. This form must be approved and signed by the head of the department from which the degree will be awarded, and the head of the department from which the minor will be awarded.

Applied Biological Sciences Minor

Contact Information

Lori D. Coble, Interim Department Head

Department of Chemistry and Applied Biological Sciences

Chemical and Biological Engineering/Chemistry 3317

Office Phone: 605-394-5132

E-mail: Lori.Coble@sdsmt.edu

MINOR IN APPLIED BIOLOGICAL SCIENCES

Credits Required 19

The core curriculum requires students to complete 12 hours of core biology classes that are required in the ABS major program. The additional 7 hours of electives are chosen from a variety of biology classes that will supplement the student's major field to broaden the student's overall academic preparation for a science or engineering career.

A grade of 'C' or better will be required for all courses needed for the biology minor. At least 50% of biology courses applied toward a minor must be completed at SDSM&T.

Required Courses: 12 Credits

- BIOL 151 General Biology I **Credits: (3-0) 3**
- BIOL 151L General Biology I Lab **Credits: (0-1) 1**
- BIOL 153 General Biology II **Credits: (3-0) 3**
- BIOL 153L General Biology II Lab **Credits: (0-1) 1**
- BIOL 371 Genetics **Credits: (3-0) 3**
- BIOL 371L Genetics Lab **Credits: (0-1) 1**

Elective Courses: 7 Credits

- BIOL 311 Principles of Ecology **Credits: (3-0) 3**
- BIOL 221 Human Anatomy **Credits: (3-0) 3**
- BIOL 221L Human Anatomy Lab **Credits: (0-1) 1**
- BIOL 326 Biomedical Physiology **Credits: (3-0) 3**
- BIOL 326L Biomedical Physiology Lab **Credits: (0-1) 1**
- BIOL 331 Microbiology **Credits: (3-0) 3**
- BIOL 331L Microbiology Lab **Credits: (0-1) 1**
- BIOL 341 Microbial Processes in Engineering and Natural Sciences **Credits: (3-0) 3**
- BIOL 341L Microbial Processes Laboratory **Credits: (0-1) 1**
- BIOL 375 Current Bioethical Issues **Credits: (3-0) 3**
- BIOL 406/506 Global Environmental Change **Credits: (3-0) 3**
- BIOL 423 Pathogenesis **Credits: (3-0) 3**
- BIOL 423L Pathogenesis Lab **Credits: (0-1) 1**
- BIOL 438/538 Industrial Microbiology **Credits: (3-0) 3**

- BIOL 455/555 DNA Structure and Function **Credits: (3-0) 3**
- BIOL 446/546 Molecular Cell Biology **Credits: (3-0) 3**
- BIOL 478/578 Microbial Genetics **Credits: (3-0) 3**
- BIOL 480/580 Bioinformatics **Credits: (3-0) 3**
- BIOL 498 Undergraduate Research/Scholarship **Credits: 1 to 12**
- CHEM 464/564 Biochemistry I **Credits: (3-0) 3**
- CHEM 464L/564L Biochemistry I Lab **Credits: (0-1) 1**
- CHEM 465/565 Biochemistry II **Credits: (3-0) 3**
- CHEM 465L Biochemistry Laboratory II **Credits: (0-1) 1**
- BIOL 383 Bioethics **Credits: (3-0) 3**

Atmospheric Sciences Minor

Contact Information

Dr. Adam French

Atmospheric and Environmental Sciences Program
Mineral Industries 208
(605) 394-1649
E-mail: Adam.French@sdsmt.edu

Undergraduate minor in Atmospheric Sciences

Students from any discipline at SDSM&T may pursue a minor in atmospheric sciences by completing 18 credit hours of coursework as described below.

Required Courses (12 cr)

- AES 201 Introduction to Atmospheric Sciences **Credits: (3-0) 3**
- AES 406/506 Global Environmental Change **Credits: (3-0) 3**
- AES 404/504 Atmospheric Thermodynamics **Credits: 2 or 3 ***
- AES 450/450L Synoptic Meteorology I/Lab **Credits: (2-1) 3 #**
** AES 404/504 may be replaced with a suitable 3-credit thermodynamics course, including CBE 321, ME 211, or MET 320. PHYS 341 may also be used in place of AES 404, however an additional elective will be required to reach the 18 credit total.*

Atmospheric Science Electives (3-6 cr)

At least three, elective credit hours are selected from the following list of atmospheric science electives** (six hours total can be applied to the minor):

- AES 401/501 Atmospheric Physics **Credits: (3-0) 3 #**
- AES 403/503 Biogeochemistry **Credits: (3-0) 3 #**
- AES 405/505 Air Quality **Credits: (3-0) 3 #**
- AES 419/519 High-Performance Computing in Earth Sciences **Credits: (3-0) 3 #**
- AES 430/530 Radar Meteorology **Credits: (3-0) 3 #**
- AES 460/560 Atmospheric Dynamics **Credits: (3-0) 3 #**
- AES 455/455L/555/555L Synoptic Meteorology II/Lab **Credits: (2-1) 3**
*** Select graduate courses in Atmospheric and Environmental Science may also be counted, with permission of instructor and program coordinator.*

Other Electives (0-3 cr)

Up to three credit hours from the following electives may be selected:

- CBE 485/585 Renewable and Sustainable Energy **Credits: (3-0) 3**
- CEE 326 Environmental Engineering I **Credits: (3-0) 3**
- CEE 425/525 Sustainable Engineering **Credits: (3-0) 3**
- CEE 437/437L/537/537L Watershed and Floodplain Modeling/Lab **Credits: (2-1) 3**
- EM 328 Applied Fluid Mechanics **Credits: (3-0) 3**
- EM 331 Fluid Mechanics **Credits: (3-0) 3**
- GEOE 475/475L/575/575L Groundwater/Lab **Credits: (2-1) 3**
- ME 430 Introduction to Wind Energy Engineering **Credits: (3-0) 3**
- MEM 401/401L Theoretical and Applied Mine Ventilation/Lab **Credits: (3-1) 4**
- MEM 405 Mine Permitting and Reclamation **Credits: (3-0) 3**
- POLS 407 Environmental Law & Policy **Credits: (3-0) 3**

Curriculum Notes

[#]Course is offered every other year.

Chemistry Minor

Contact Information

Dr. Zhengtao Zhu

Associate Director of Chemistry

Associate Professor

Department of Chemistry and Applied Biological Sciences

Chemical and Biological Engineering/Chemistry 3314

Office Phone: (605) 394-2447

Email: Zhengtao.Zhu@sdsmt.edu

MINOR IN CHEMISTRY

The goal of this minor is to provide students with a solid, albeit limited, background in chemistry. The minor requires 20 hours of CHEM courses (8 hours of required courses; 12 hours of elective courses). A grade of 'C' or better is required for all courses needed for the chemistry minor. At least 50% of chemistry courses applied toward a minor must be completed at SDSM&T.

Required Courses: 8 Credit Hours

- CHEM 112 General Chemistry I **Credits: (3-0) 3**
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1**
- CHEM 114 General Chemistry II **Credits: (3-0) 3**
- CHEM 114L General Chemistry II Lab **Credits: (0-1) 1**

Elective Courses: 12 Credit hours

Twelve (12) credit hours of courses at the 300-level or above, including one 400-level course, are required. Elective courses must represent 3 of the 6 areas of chemistry (Analytical, Biochemistry, Inorganic, Organic, Polymer, and Physical Chemistry). Laboratory courses are required for two (2) of these elective courses. For courses that are offered at 2 or 3 credits, the 3-credit option must be used.

Elective options include:

- CHEM 326 Organic Chemistry I **Credits: (3-0) 3**
- CHEM 326L Organic Chemistry I Lab **Credits: (0-2) 2**
- CHEM 328 Organic Chemistry II **Credits: (3-0) 3**
- CHEM 328L Organic Chemistry II Lab **Credits: (0-2) 2**
- CHEM 332 Analytical Chemistry **Credits: 2 or 3 ***
- CHEM 332L Analytical Chemistry Lab **Credits: (0-1) 1**
- CHEM 342 Physical Chemistry I **Credits: 2 to 3**
- CHEM 342L Physical Chemistry I Lab **Credits: (0-1) 1**
- CHEM 344 Physical Chemistry II **Credits: 2 to 3 ***
- CHEM 344L Physical Chemistry II Lab **Credits: 1 to 2**
- CHEM 420/520 Organic Chemistry III **Credits: (3-0) 3**
- CHEM 426/526 Polymer Chemistry **Credits: (3-0) 3**

- CHEM 434 Instrumental Analysis **Credits: (3-0) 3**
- CHEM 434L Instrumental Analysis Lab **Credits: (0-2) 2**
- CHEM 452/552 Inorganic Chemistry **Credits: (3-0) 3**
- CHEM 452L/552L Inorganic Chemistry Lab **Credits: (0-1) 1**
- CHEM 464/564 Biochemistry I **Credits: (3-0) 3**
- CHEM 464L/564L Biochemistry I Lab **Credits: (0-1) 1**

Curriculum Notes

*** Only the three (3) credit version of this course may be used for completion of the Chemistry Minor.**

Computational Statistics Minor

Contact Information

Dr. Kyle Riley

Department of Mathematics and Computer Science

McLaury 308

(605) 394-2471

E-mail: Kyle.Riley@sdsmt.edu

The South Dakota School of Mines and Technology offers a minor in computational statistics, which is a great way to prepare any graduate for a career that involves intensive use of data. A minor in computational statistics must be approved by the student's major department along with the approval of the Department Head for Mathematics and Computer Science. Students majoring in Applied and Computational Mathematics are not eligible for the minor in computational statistics.

The Core Coursework Includes

- MATH 225 Calculus III **Credits: (4-0) 4**
- MATH 315 Linear Algebra **Credits: (3-0) 3**
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**
or
- IENG 381 Introduction to Probability and Statistics **Credits: (3-0) 3**

The Elective Coursework Includes

The elective courses are devised into three categories and a student that seeks to earn the minor must complete the requirements of each category.

Computation

At least 3 credits in computation, which can be satisfied from the following list:

- CSC 150/150L Computer Science I/Lab **Credits: (2-1) 3**
- CSC 170/170L Programming for Engineers and Scientists **Credits: (3-0) 3**
- CBE 117L Programming for Chemical and Biological Engineering **Credits: (0-1) 1**
- CBE 250 Computer Applications in Chemical Engineering **Credits: (2-0) 2**

Informatics/Statistics

And at least 3 credits from the informatics/statistics category, which can be satisfied from the following list:

- MATH 382 Probability Theory and Statistics II **Credits: (3-0) 3**
or
- IENG 382 Probability Theory and Statistics II **Credits: (3-0) 3**
- GEOL 419/519 Advanced Geospatial Analysis **Credits: (3-0) 3**
- BIOL 480/580 Bioinformatics **Credits: (3-0) 3**

Data Analysis

And at least 2 credits from the data analysis category, which can be satisfied from the following list:

- MATH 443/543 Data Analysis **Credits: (3-0) 3**
- MATH 447/547 Design of Experiments **Credits: (3-0) 3**
- CBE 488/588 Applied Design of Experiments for the Chemical Industry **Credits: (2-0) 2**

Computer Science Minor

Contact Information

Dr. Kyle Riley

Department of Mathematics and Computer Science
McLaury 308
(605) 394-2471
E-mail: Kyle.Riley@sdsmt.edu

A minor in the Department of Mathematics and Computer Science must be approved by the student's major department. The Office of the Registrar has forms that should be completed and signed by the department heads from both departments involved in this minor.

The core coursework includes

- CSC 150/150L Computer Science I/Lab **Credits: (2-1) 3**
- CSC 250 Computer Science II **Credits: (4-0) 4**
- CSC 251 Finite Structures **Credits: 2 or 4**
- CSC 300 Data Structures **Credits: (4-0) 4**
- At least 6 credit hours from an approved list.

The approved list of courses for the minor:

- CSC 314/314L Assembly Language/Lab **Credits: (2-1) 3**
- CSC 317 Computer Organization and Architecture **Credits: (3-0) 3**
- CSC 372 Analysis of Algorithms **Credits: (3-0) 3**
- CSC 410/510 Parallel Computing **Credits: (3-0) 3**
- CSC 412/512 Cryptography **Credits: (3-0) 3**
- CSC 415/415L/515/515L Introduction to Robotics/Lab **Credits: (3-1) 4**
- CSC 416/516 Advanced Algorithms for Robotics **Credits: (3-0) 3**
- CSC 468/568 Graphical User Interface Programming **Credits: (3-0) 3**
- CSC 433/533 Computer Graphics **Credits: (3-0) 3**
- CSC 441/541 Networking and Data Communications **Credits: (3-0) 3**
- CSC 442/542 Digital Image Processing **Credits: (3-0) 3**
- CSC 445/545 Introduction to Theory of Computation **Credits: (3-0) 3**
- CSC 447/547 Artificial Intelligence **Credits: (3-0) 3**
- CSC 448/548 Machine Learning **Credits: (3-0) 3**
- CSC 449/549 Advanced Topics in Artificial Intelligence **Credits: (3-0) 3**
- CSC 456/456L Operating Systems/Lab **Credits: (3-1) 4**
- CSC 461 Programming Languages **Credits: (4-0) 4**
- CSC 470 Software Engineering **Credits: (3-0) 3**
- CSC 476/476L/576/576L Mobile Computing Development **Credits: (2-1) 3**
- CSC 484 Database Management Systems **Credits: (3-0) 3**

Environmental Engineering Minor

Contact Information

Dr. Venkata. R. Gadhamshetty, P.E, BCEE

Program Coordinator

Department of Civil and Environmental Engineering

Civil/Mechanical 237B

(605) 394-1997

E-mail: Venkata.Gadhamshetty@sdsmt.edu

Students from any discipline at the School of Mines may pursue a minor in environmental engineering by completing 18 credit hours of coursework as described below. Students must complete the Notification of Intent to Seek a Minor form, with appropriate signatures and turn it into the registrar's office by the beginning of the first semester of the senior year.

Required core courses:

- CEE 326 Environmental Engineering I **Credits: (3-0) 3**
- CEE 327/327L Environmental Engineering II/Lab **Credits: (2-1) 3**
- CEE 426/526 Environmental Engineering Unit Operations and Processes **Credits: (3-0) 3**
- CEE 427/527 Environmental Engineering Biological Process Design **Credits: (3-0) 3**

Elective course

In addition, students select two 3-credit elective courses from the list below. To ensure that enrollees gain the broad and interdisciplinary background expected in the environmental engineering discipline, one elective must be taken from a discipline outside the student's major field of study.

- CBE 455/555 Pollution Phenomena and Process Design **Credits: (3-0) 3**
- BIOL 341 Microbial Processes in Engineering and Natural Sciences **Credits: (3-0) 3**
- CHEM 326 Organic Chemistry I **Credits: (3-0) 3**
- CHEM 482/582 Environmental Chemistry **Credits: (3-0) 3**
- GEOE 475/475L/575/575L Groundwater/Lab **Credits: (2-1) 3**
- IENG 331 Safety Engineering **Credits: (3-0) 3**
- MEM 405 Mine Permitting and Reclamation **Credits: (3-0) 3**
- MET 220 Mineral Processing and Resource Recovery **Credits: (3-0) 3**
- MET 220L Mineral Processing and Resource Recovery Laboratory **Credits: (0-1) 1**
- GEOE 421/521 Aqueous Geochemistry **Credits: (3-0) 3**
- **OR**
- CEE 421/521 Aqueous Geochemistry **Credits: (3-0) 3**
- CBE 217 Chemical Engineering Material Balances **Credits: (3-0) 3**
- IENG 431/531 Industrial Hygiene **Credits: (3-0) 3**
- AES 405/505 Air Quality **Credits: (3-0) 3**
- GEOE 221/221L Geology for Engineers/Lab **Credits: (2-1) 3**
- CEE 428/528 Oil and Gas Development and the Environment **Credits: (3-0) 3**

Environmental Science Minor

Contact Information

Lisa A. Kunza

Assistant Professor

Chemistry and Applied Biological Sciences

MI 206

(605) 394-2449

Email: Lisa.Kunza@sdsmt.edu

MINOR IN ENVIRONMENTAL SCIENCE

Credits Required 19

The core curriculum requires students to complete a minimum of 19 credit hours, including 13 credit hours of required courses in Biology and Chemistry, and 6 credit hours of elective courses from various disciplines. The Environmental Science Minor will supplement the student's major field to broaden the student's overall academic preparation for a science or engineering career.

Required Courses: 13 Credits

- BIOL 151 General Biology I **Credits: (3-0) 3**
- CHEM 114 General Chemistry II **Credits: (3-0) 3**
- BIOL 311 Principles of Ecology **Credits: (3-0) 3**
- BIOL 311L Principles of Ecology Laboratory **Credits: (0-1) 1**
- **One of the following:**
- BIOL 406/506 Global Environmental Change **Credits: (3-0) 3**
- **or**
- AES 406/506 Global Environmental Change **Credits: (3-0) 3**

Elective Courses: 6 Credits

- BIOL 333/333L Aquatic Ecology & Watershed Management **Credits: (4-0) 4**
- BIOL 331 Microbiology **Credits: (3-0) 3**
- BIOL 331L Microbiology Lab **Credits: (0-1) 1**
- AES 401/501 Atmospheric Physics **Credits: (3-0) 3**
- AES 403/503 Biogeochemistry **Credits: (3-0) 3**
- AES 404/504 Atmospheric Thermodynamics **Credits: 2 or 3**
- AES 405/505 Air Quality **Credits: (3-0) 3**
- CBE 485/585 Renewable and Sustainable Energy **Credits: (3-0) 3**
- CEE 325 Introduction to Sustainable Design **Credits: (3-0) 3**
- CEE 326 Environmental Engineering I **Credits: (3-0) 3**
- CEE 327/327L Environmental Engineering II/Lab **Credits: (2-1) 3**
- CEE 337 Engineering Hydrology **Credits: (3-0) 3**
- CEE 425/525 Sustainable Engineering **Credits: (3-0) 3**

- CEE 428/528 Oil and Gas Development and the Environment **Credits: (3-0) 3**
- CHEM 482/582 Environmental Chemistry **Credits: (3-0) 3**
- GEOE 475/475L/575/575L Groundwater/Lab **Credits: (2-1) 3**
- GEOL 416/416L/516/516L Introduction to GIS/Lab **Credits: (2-1) 3**
- MEM 401/401L Theoretical and Applied Mine Ventilation/Lab **Credits: (3-1) 4**
- MEM 405 Mine Permitting and Reclamation **Credits: (3-0) 3**
- POLS 407 Environmental Law & Policy **Credits: (3-0) 3**

Geology Minor

Contact Information

Dr. Laurie Anderson, Department Head

Department of Geology and Geological Engineering

Mineral Industries 303

(605) 394-2461

E-mail: Laurie.Anderson@sdsmt.edu

Geology Courses

The minor in geology requires completion of eighteen (18) credit hours of geology courses (courses with a GEOL prefix) including the following:

- GEOL 201 Physical Geology **Credits: (3-0) 3**
- GEOL 201L Physical Geology Laboratory **Credits: (0-1) 1**
- GEOL 212/212L Mineralogy and Crystallography/Lab **Credits: (2-1) 3**
- GEOL 331/331L Stratigraphy and Sedimentation/Lab **Credits: (2-1) 3**
- GEOL 341/341L Igneous and Metamorphic Petrology/Lab **Credits: (2-1) 3**
- GEOL 322/322L Structural Geology/Lab **Credits: (2-1) 3**

For more information on this minor see the Department of Geology and Geological Engineering page under Undergraduate Studies in this catalog.

Note(s):

GEOE 221/221L and one additional geology elective credit may be substituted for GEOL 201/GEOL 201L. No other substitutions are permitted for this minor.

Geospatial Technology Minor

Contact Information

Mr. Curtis Price, Lecturer

Department of Geology and Geological Engineering
Mineral Industries 301
(605) 394-2461
E-mail: Curtis.Price@sdsmt.edu

The Minor in Geospatial Technology requires completion of eighteen (18) credit hours of courses, including

- GEOL 416/416L/516/516L Introduction to GIS/Lab **(2-1) 3**
- GEOL 417/517 Geospatial Databases **(3-0) 3**
- GEOL 419/519 Advanced Geospatial Analysis **(3-0) 3**
- GEOL 420/520 Introduction to Remote Sensing **(3-0) 3**

Six additional credits taken from any of the groups below complete the minor. Up to three credits of a senior capstone, research, or design project with a significant proportion of geospatial content may be substituted for one elective, with permission of the geospatial programs coordinator, Mr. Curtis Price. E-mail: Curtis.Price@sdsmt.edu. For more information on this certificate see the Department of Geology and Geological Engineering page under Undergraduate Studies in this catalog.

One of these surveying courses may be applied to the minor:

- CEE 206/206L Engineering Surveys I/Lab **Credits: (2-1) 3**
- MEM 201L Surveying for Mineral Engineers **Credits: (0-2) 2**

One of these statistics courses may be applied to the minor:

- MATH 281 Introduction to Statistics **Credits: (3-0) 3**
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**
- MEM 307 Mineral Exploration and Geostatistics **Credits: (3-0) 3**

One of these programming courses may be applied to the minor:

- CEE 284 Applied Numerical Methods **Credits: (3-0) 3**
- CBE 117L Programming for Chemical and Biological Engineering **Credits: (0-1) 1**
- CSC 111/111L Introduction to Computer Programming/Lab **Credits: (2-0) 2**
- CSC 150/150L Computer Science I/Lab **Credits: (2-1) 3**
- CSC 170/170L Programming for Engineers and Scientists **Credits: (3-0) 3**

Any of these courses may be applied to the minor:

- CEE 437/437L/537/537L Watershed and Floodplain Modeling/Lab **Credits: (2-1) 3**
- CSC 250 Computer Science II **Credits: (4-0) 4**
- CSC 442/542 Digital Image Processing **Credits: (3-0) 3**
- CSC 484 Database Management Systems **Credits: (3-0) 3**
- MEM 301/301L Computer Applications in Mining/Lab **Credits: (1-1) 2**

Global Engineering Minor

Contact Information

Dr. Jennifer Benning

Program Coordinator

Department of Civil and Environmental Engineering

Civil/Mechanical 241

(605) 394-2425

E-mail: Jennifer.Benning@sdsmt.edu

Well prepared engineers must possess skills and attitudes needed for working on multidisciplinary teams that are increasingly multicultural and global in nature. In a recent survey of employers recruiting on campus, 68% said that competence in cultural and global diversity was important for career success in their organizations.

An immersion experience in a different culture is the best way to learn to meet cross-cultural challenges in the areas of communication, values, beliefs, politics, language, and ethics. Students will gain this experience by creating and completing an engineering project in a culture that is significantly different than their own. The project will develop skills in verbal and non-verbal communication and working on a multicultural team. Earning this minor will provide evidence to employers of the ability to understand client expectations and unspoken priorities and select appropriate and indigenous technology. Students from any engineering discipline at the School of Mines may pursue a minor in global engineering by completing 18 credit hours of coursework.

The minor will more fully prepare graduates as global professionals and give graduates competitive advantages in seeking employment.

Students from any engineering discipline at the School of Mines may pursue a minor in global engineering by completing 18 credit hours of coursework as described below.

Required Core Courses:

Students must complete the Notification of Intent to Seek a Minor form, with appropriate signatures and turn it into the Registrar's Office by the beginning of the first semester of the senior year. Students must complete a three (3) cross-cultural engineering design activity (e.g., an approved design project, co-op, or engineering design course in a foreign culture or country). This design activity can take the form of (1) an approved design project in a foreign country or culture, or (2) a co-op or engineering design course in a foreign country or culture. The design credit activity must be pre-approved by the program coordinator and a technical advisor. Select 3 credits from the list below:

- CP 297/397/497 Cooperative Education **Credits: 1 to 3**
- EXPL 285/385/485/585/685 Study Abroad Experiences **Credits: 1 to 3**
- EXCH 289 Student Exchange - International **Credits: 0 to 18**
- EXCH 389 Student Exchange - International **Credits: 0 to 16**
- EXCH 489 Student Exchange - International **Credits: 0 to 18**
- xxx 464 Capstone Design I (prefix varies with department) **Credits: (0-1) 1**
- xxx 465 Capstone Design II (prefix varies with department) **Credits: (0-2) 2**
- CEE 489 Capstone Design Project **Credits: (0-3) 3**
- CEE 498 Undergraduate Research/Scholarship **Credits: 1 to 6**
- CEE 491 Independent Study **Credits: 1 to 3**
- CBE 466 Capstone Design for Chemical Engineering **Credits: (0-2) 2**

- CBE 487 Global and Contemporary Issues in Chemical Engineering **Credits: 1-0) 1**
- ME 477 Mechanical Engineering Design I **Credits: (0-2) 2**
- ME 479 Mechanical Systems Design II **Credits: (0-2) 2**
- MEM 464 Mine Design and Feasibility Study **Credits: (0-4) 4**

Elective Courses for Cross-Cultural Teamwork and Project Management:

Students will be required to select six (6) credits from the list below to improve cross-cultural teamwork or project management. Two or more different prefixes are required.

- IENG 352 Creativity and Innovation **Credits: (1-0) 1**
- IENG 366 Engineering Management **Credits: (3-0) 3**
- MSL 201 Innovative Team Leadership **Credits: (1-0) 1**
- PSYC 319 Teams and Teaming **Credits: (1-0) 1**
- PSYC 331 Industrial and Organizational Psychology **Credits: (3-0) 3**
- CEE 474/574 Construction Engineering and Management **Credits: (3-0) 3**

Elective Courses for Cross-Cultural Understanding and Communication:

Students will be required to select nine (9) elective credit hours that expand the understanding of human nature, social systems, cross cultural communication in, or engineering practices in a global context*

- ANTH 210 Cultural Anthropology **Credits: (3-0) 3**
- EXCH 289 Student Exchange - International **Credits: 0 to 18**
- EXCH 389 Student Exchange - International **Credits: 0 to 16**
- EXCH 489 Student Exchange - International **Credits: 0 to 18**
- EXPL 285/385/485/585/685 Study Abroad Experiences **Credits: 1 to 3**
- GEOG 210 World Regional Geography **Credits: (3-0) 3**
- GEOG 400 Cultural Geography **Credits: (3-0) 3**
- GER 101 Introductory German I **Credits: (4-0) 4 ****
- GER 102 Introductory German II **Credits: (4-0) 4 ****
- POLS 250 Introduction to International Relations **Credits: (3-0) 3**
- POLS 350 International Relations **Credits: (3-0) 3**
- PSYC 461 Theories of Personality **Credits: (3-0) 3**
- SOC 100 Introduction to Sociology **Credits: (3-0) 3**
- SPAN 101 Introductory Spanish I **Credits: (4-0) 4 ****
- SPAN 102 Introductory Spanish II **Credits: (4-0) 4 ****

* Specialized courses being developed in conjunction with efforts to create study-abroad pathways within all undergraduate programs of study will be considered for inclusion as electives as they are developed (i.e., CBE 487, Global and Contemporary Issues in Chemical Engineering).

**Intermediate or advanced language courses or language courses taken while studying abroad may be substituted for introductory German or Spanish with approval of the program coordinator.

Materials Science - Metals Minor

Contact Information

Department Head

Dr. Michael K. West
Department of Materials and Metallurgical Engineering
Mineral Industries 108
(605) 394-1283
E-mail: Michael.West@sdsmt.edu

Department Main Office

Administrative Assistant
Jessica Zacher, Senior Secretary
Department of Materials and Metallurgical Engineering
Mineral Industries 115
(605) 394-2341
Email: Jessica.Zacher@sdsmt.edu

This minor is designed for students in engineering and science disciplines that desire focused training in the field of materials science with special emphasis on metals. Students completing the minor in materials science-metals will demonstrate the following outcomes:

1. A proficiency in materials science concepts covering metals and alloys;
2. The ability to develop and improve new metals/alloys;
3. The ability to predict and evaluate the performance of metals and alloys.

Given the redundancy in the B.S. metallurgical engineering core curriculum, the minor in materials science-metals is not available to those students who receive a B.S. degree in metallurgical engineering. A minor in materials science-metals must be approved by the student's major department. The Office of the Registrar and Academic Services has forms that should be completed and signed by the department heads from both departments involved in this minor.

The requirements for a minor in materials science - Metals are

- MET 232 Properties of Materials **Credits: (3-0) 3**
- MET 330 Physics of Metals **Credits: (3-0) 3**
- MET 332 Thermomechanical Processing **Credits: (3-0) 3**

Three classes from

- MET 426/526 Steelmaking **Credits: (3-0) 3**
- MET 430/430L Welding Engineering and Design of Welded Structures/Lab **Credits: (2-1) 3**
- MET 432/532 Advanced Materials and Processes **Credits: (3-0) 3**
- MET 440/540 Mechanical Metallurgy **Credits: (3-0) 3**
- MET 445/545 Oxidation and Corrosion of Metals **Credits: (3-0) 3**
- MET 450/550 Forensic Engineering **Credits: (3-0) 3**

Total: 18 Credits

Curriculum Notes

MET 330, MET 332, MET 426/526, MET 430/430L, MET 432/532, MET 440/540, MET 445/545, and MET 450/550 are offered in alternate years, so plans for a materials science-metals minor should be made early.

Mathematics Minor

Contact Information

Dr. Kyle Riley

Department of Mathematics and Computer Science

McLaury 308

(605) 394-2471

E-mail: Kyle.Riley@sdsmt.edu

A minor in the Department of Mathematics and Computer Science must be approved by the student's major department. The Office of the Registrar and Academic Services has forms that should be completed and signed by the department heads from both departments involved in this minor.

The coursework includes:

- MATH 123 Calculus I **Credits: (4-0) 4**
- MATH 125 Calculus II **Credits: (4-0) 4**
- MATH 225 Calculus III **Credits: (4-0) 4**
- CSC 251 Finite Structures **Credits: 2 or 4**

(The 2-credit version of CSC 251 requires completion of a special permission of instructor form. A student enrolled in a major that requires the 4 credit CSC 251 must complete the 4 credit offering.)

The required course list also includes the choice of MATH 423 Advanced Calculus I or MATH 413 Abstract Algebra I.

Lastly, the mathematics minor requires at least 6 more credits from: MATH 315, MATH 381, MATH 382, or any MATH course 400-level and above, excluding Special Topics and Independent Studies courses.

Military Science Minor

Contact Information

Lieutenant Colonel Elvis Coronado

United States Army Professor of Military Science Department

Classroom Building, Rm 112

(605) 394-2769

E-mail: Elvis.Coronado@sdsmt.edu

Minor in Military Science

Credits Required 18

The core curriculum for a Minor in Military Sciences requires students to complete 18 credits in leadership development and advanced military science. Participation in this minor is contingent upon completion of ROTC basic courses or equivalent training. Students from any discipline may pursue a minor in military science with approval from the Professor of Military Science

Students must receive a cumulative military science grade of 'B' or better within all courses required for the military science minor.

Required Courses: 18 Credits

- MSL 301 Adaptive Team Leadership **Credits: (2-0) 2**
- MSL 301L Adaptive Team Leadership Lab **Credits: (0-2) 2**
- MSL 302 Leadership in Changing Environments **Credits: (2-0) 2**
- MSL 302L Leadership in Changing Environments Lab **Credits: (0-2) 2**
- MSL 401 Developing Adaptive Leaders **Credits: (2-0) 2**
- MSL 401L Developing Adaptive Leaders Lab **Credits: (0-2) 2**
- MSL 402 Leadership in a Complex World **Credits: (2-0) 2**
- MSL 402L Leadership in a Complex World Lab **Credits: (0-2) 2**
- MSL 494 Leader Development and Assessment Course **Credits: 3 to 4**

Occupational Safety Minor

Contact Information

Dr. Adam Piper

Associate Professor

Department of Industrial Engineering

LIB 130

(605) 394-1930

E-mail: Adam.Piper@sdsmt.edu

The minor in occupational safety is offered to students pursuing any B.S. degree program.

Application Procedures

Students should contact the program coordinator for the application procedure and appropriate forms.

Certification Check

Once an application is filed, it is included in the degree audit form. It is the responsibility of the student's advisor to certify certification completion along with the final degree audit.

Program Requirements

Completion of the occupational safety minor requires a minimum of 21 credits in addition to the minimum math and science requirements listed below. Courses must include the required safety courses (15 credits) and 6 credits selected for the list of elective courses. The minor must be approved by the student's major department and the minor coordinator on a form available at the Office of the Registrar and Academic Services. Additional information may be found at the department website: <http://ie.sdsmt.edu>.

The minimum math and science course requirements are

- CHEM 112 General Chemistry I **Credits: (3-0) 3**
- CHEM 112L General Chemistry I Lab **Credits: (0-1) 1**
- MATH 123 Calculus I **Credits: (4-0) 4**
- PHYS 111 Introduction to Physics I **Credits: (3-0) 3**
OR
- PHYS 211/211A University Physics I/Recitation **Credits: (3-0) 3**
- MATH 281 Introduction to Statistics **Credits: (3-0) 3**
OR
- MATH 381 Introduction to Probability and Statistics **Credits: (3-0) 3**

Required courses are

- IENG 321/321L Ergonomics/Human Factors Engineering/Lab **Credits: (2-1) 3**
- IENG 331 Safety Engineering **Credits: (3-0) 3**
- IENG 431/531 Industrial Hygiene **Credits: (3-0) 3**
- PSYC 331 Industrial and Organizational Psychology **Credits: (3-0) 3 OR**
- POLS 407 Environmental Law & Policy **Credits: (3-0) 3**
- Senior Design or Senior Project in home department¹

Elective Courses (A minimum of 6 credit hours):

- BIOL 121 Basic Anatomy **Credits: (3-0) 3**
- BIOL 121L Basic Anatomy Lab **Credits: (0-1) 1**
- BIOL 221 Human Anatomy **Credits: (3-0) 3**
- BIOL 221L Human Anatomy Lab **Credits: (0-1) 1**
- BIOL 326 Biomedical Physiology **Credits: (3-0) 3**
- BIOL 326L Biomedical Physiology Lab **Credits: (0-1) 1**
- CEE 326 Environmental Engineering I **Credits: (3-0) 3**
- CHEM 114 General Chemistry II **Credits: (3-0) 3**
- CHEM 114L General Chemistry II Lab **Credits: (0-1) 1**
- CHEM 316 Fundamentals of Organic Chemistry **Credits: (3-0) 3**
- CHEM 326 Organic Chemistry I **Credits: (3-0) 3**
- CHEM 326L Organic Chemistry I Lab **Credits: (0-2) 2**
- CP 297/397/497 Cooperative Education **Credits: 1 to 3**¹
- IENG 491 Independent Study **Credits: 1 to 3**¹
- IENG 492/592 Topics **Credits: 1 to 3**¹
- PE 105 Wellness & Physical Fitness **Credits: (1-0) 1**

Curriculum Notes

¹ Projects must be pre-approved and have significant safety content.

Petroleum Systems Minor

Contact Information

Dr. Laurie Anderson, Department Head

Department of Geology and Geological Engineering

Mineral Industries 303

(605) 394-2461

E-mail: Laurie.Anderson@sdsmt.edu

Program Requirements

The Minor in Petroleum Systems requires completion of eighteen (18) credit hours of courses. A minimum of six credits must be for courses outside of those that are required or elective in a student's major. For more information on this minor see the Department of Geology and Geological Engineering page under Undergraduate Studies in this catalog.

Required Courses (9 credits)

- GEOE 412/512 Science and Engineering Field Applications **Credits: 3 to 6** (Petroleum Field Camp section only- **Credits: 3**)
- GEOE 461/561 Petroleum Drilling and Production Engineering **Credits: (3-0) 3**
One of:
- CBE 218 Chemical Engineering Fluid Mechanics **Credits: (3-0) 3**
or
- ME 331 Thermo Fluid Dynamics **Credits: (3-0) 3**
or
- EM 331 Fluid Mechanics **Credits: (3-0) 3**

Elective Courses (9 credits from this list)

- CBE 217 Chemical Engineering Material Balances **Credits: (3-0) 3**
- CBE 222 Chemical Engineering Process Thermodynamics **Credits: (3-0) 3**
- CBE 321 Chemical Engineering Equilibrium Thermodynamics **Credits: (3-0) 3**
- CBE 417 Chemical Engineering Equilibrium Separations **Credits: (2-0) 2**
- CBE 444/544 Reactor Design **Credits: (3-0) 3**
- CBE 445/545 Oxidation and Corrosion of Metals **Credits: (3-0) 3**
- CBE 482/582 Upstream Oil and Gas Processing **Credits: 1 or 3**
- CBE 483/583 Petroleum Refining **Credits: 2 or 3**
- CBE 485/585 Renewable and Sustainable Energy **Credits: (3-0) 3**
- CBE 485L/585L Renewable and Sustainable Energy Lab **Credits: (0-1) 1**
- CEE 326 Environmental Engineering I **Credits: (3-0) 3**
- CEE 428/528 Oil and Gas Development and the Environment **Credits: (3-0) 3**
- GEOE 324/324L Engineering Geophysics I/Lab **Credits: (2-1) 3**
- GEOE 462/462L/562/562L Well Log Analysis/Laboratory **Credits: (2-1) 3**
- GEOL 450 Fluid and Thermal Diffusion **Credits: (3-0) 3**

- GEOL 476/576 Petroleum Geology **Credits: (3-0) 3**
- ME 269/269L Energy Systems Product Development and Design/Lab **Credits: (2-2) 4**
- ME 402/502 Gas Dynamics **Credits: (3-0) 3**

Physics Minor

Contact Information

Dr. Richard W. Schnee

Department of Physics

Electrical Engineering/Physics 223

(605) 394-2364

E-mail: Richard.Schnee@sdsmt.edu

A minor in physics requires a minimum of 18 hours of courses in physics, which must include PHYS 213/213-A, and at least 15 hours of physics courses numbered higher than PHYS 213/213-A. All minors in physics must be approved by the department and must conform to the institutional policies and guidelines for minors.

Robotics Minor

Contact Information

Dr. Kyle Riley

Department of Mathematics and Computer Science

McLaury 308

(605) 394-2471

E-mail: Kyle.Riley@sdsmt.edu

The South Dakota School of Mines and Technology offers a minor in robotics, which is a great way to enhance any program of study to prepare graduates for a workplace that has become highly automated. A minor in robotics must be approved by the student's major department along with the approval of the Department Head for Mathematics and Computer Science.

The core coursework includes

- MATH 225 Calculus III **Credits: (4-0) 4**
- CSC 315 Data Structures & Algorithms **Credits: (4-0) 4**
- CSC 415/415L/515/515L Introduction to Robotics/Lab **Credits: (3-1) 4**
- **OR**
- CENG 415/415L/515/515L Introduction to Robotics/Lab **Credits: (3-1) 4**

Additional 6 credits from courses on an approved list

The minor is then complete with an additional 6 credits from courses on an approved list. The approved list of courses for the minor:

- CSC 414/514 Introduction to Computer Vision **Credits: (3-0) 3**
- CSC 416/516 Advanced Algorithms for Robotics **Credits: (3-0) 3**
- CSC 442/542 Digital Image Processing **Credits: (3-0) 3**
- CSC 447/547 Artificial Intelligence **Credits: (3-0) 3**
- IENG 475/475L Computer-Controlled Manufacturing Systems and Robotics **Credits: (2-1) 3**
- ME 351/351L Mechatronics and Measurement Systems/Lab **Credits: (3-1) 4**
- ME 352 Introduction to Dynamic Systems **Credits: (3-0) 3**
- CENG 452/452L Robotic Control Systems/Lab **Credits: (2.5-0.5) 3**

Sustainable Engineering Minor

Contact Information

Dr. Jennifer Benning, Program Coordinator
Department of Civil and Environmental
Engineering, Civil/Mechanical 237A
(605) 394-2425
E-mail: Jennifer.Benning@sdsmt.edu

Sustainable engineering describes a new approach for solving complex classes of social problems that result from the rising competition for increasingly limited supplies of resources, water and land. Sustainable engineering seeks to transform engineering practice to meet these challenges. Interdisciplinary in nature and application, sustainable engineering involves the application of life cycle assessment and other innovative techniques to determine the long term implications of a proposed design solution with the ultimate goal of minimizing overall environmental impacts from products, services, businesses, communities and nations, as well as create engineering solutions that are fair and just in a global societal context.

Students must complete the Notification of Intent to Seek a Minor form, with appropriate signatures and turn it into the registrar's office by the beginning of the first semester of the senior year.

Students from any major at the School of Mines may pursue a minor in sustainable engineering by completing 18 credit hours of coursework that includes two required courses.

Required courses

- CEE 325 Introduction to Sustainable Design **Credits: (3-0) 3**
- CEE 425/525 Sustainable Engineering **Credits: (3-0) 3**

Engineering Electives

Six (6) elective credit hours are selected from the following list of engineering courses with sustainability content. Three of the twelve required and elective engineering course credits are required to be outside the student's major.

- CEE 326 Environmental Engineering I **Credits: (3-0) 3**
- CEE 337 Engineering Hydrology **Credits: (3-0) 3**
- CBE 455/555 Pollution Phenomena and Process Design **Credits: (3-0) 3**
- IENG 352 Creativity and Innovation **Credits: (1-0) 1**
- IENG 431/531 Industrial Hygiene **Credits: (3-0) 3**
- IENG 451/451L Operational Strategies/Lab **Credits: (2-1) 3**
- IENG 475/475L Computer-Controlled Manufacturing Systems and Robotics **Credits: (2-1) 3**
- MET 220 Mineral Processing and Resource Recovery **Credits: (3-0) 3**
- MET 310 Aqueous Extraction, Concentration, and Recycling **Credits: (3-0) 3**
- MET 321/321L High Temperature Extraction, Concentration, and Recycling/Lab **Credits: (3-1) 4**
- MEM 120 Introduction to Mining, Sustainable Development, and Safety **Credits: (3-0) 3**
- MEM 405 Mine Permitting and Reclamation **Credits: (3-0) 3**
- CBE 485/585 Renewable and Sustainable Energy **Credits: (3-0) 3**

- CBE 485L/585L Renewable and Sustainable Energy Lab **Credits: (0-1) 1**
- ME 269/269L Energy Systems Product Development and Design/Lab **Credits: (2-2) 4**

Science or mathematics electives

Three (3) elective credit hours are selected from the following list of science or mathematics courses with sustainability content.

Note: GEOG 400 may be counted as a science **OR** social science elective, but not both.

- AES 403/503 Biogeochemistry **Credits: (3-0) 3**
- AES 405/505 Air Quality **Credits: (3-0) 3**
- AES 406/506 Global Environmental Change **Credits: (3-0) 3**
- BIOL 311 Principles of Ecology **Credits: (3-0) 3**
- BIOL 341 Microbial Processes in Engineering and Natural Sciences **Credits: (3-0) 3**
- GEOL 351 Earth Resources and the Environment **Credits: (3-0) 3**
- GEOG 400 Cultural Geography **Credits: (3-0) 3**
- MATH 451/551 Math Modeling **Credits: (3-0) 3**

Humanities/Social Science Electives

Finally, three (3) elective credit hours are selected from the following list of humanities/social science courses with sustainability content.

- ANTH 210 Cultural Anthropology **Credits: (3-0) 3**
- ENGL 300 The Literary Experience of Nature **Credits: (3-0) 3**
- HUM 200 Connections: Humanities & Technology **Credits: (3-0) 3**
- POLS 250 Introduction to International Relations **Credits: (3-0) 3**
- POLS 407 Environmental Law & Policy **Credits: (3-0) 3**
- GEOG 400 Cultural Geography **Credits: (3-0) 3**

These course requirements provide students with the broad, cross-disciplinary background that leads to the type of interdisciplinary, systems thinking that is essential for developing sustainable solutions.

Minors from Other South Dakota Regental Institutions

SD Mines degree seeking students may complete requirements for any minor at any Regental university (Black Hills State University, Dakota State University, Northern State University, South Dakota State University or the University of South Dakota) that has been approved to grant that minor. This minor will be recorded on the transcript in conjunction with the degree/minor from the South Dakota School of Mines and Technology. (BOR Policy 2:29)

For information about the minors offered in the Regental system, the contact person for each university is listed below.

Black Hills State University - Contact April Meeker (605-642-6567) or April.Meeker@bhsu.edu

Dakota State University - Contact Kathy Callies (605-256-5143) or Kathy.Callies@dsu.edu

Northern State University - Contact Stephanie Hawkinson (605-626-7768) or Stephanie.Hawkinson@northern.edu

South Dakota School of Mines and Technology - Contact Diana Eastman (605-394-1288) or Diana.Eastman@sdsmt.edu

South Dakota State University - Elizabeth (Bess) Pallares (605-688-4488) Bess.Pallares@sdstate.edu

University of South Dakota - Contact Chelsey Harrington (605-677-8824) or Chelsey.Harrington@usd.edu

Certificates

Construction Engineering and Management Certificate

Contact Information

Clifford J Bienert

Interim Coordinator

Civil/Mechanical 245

(605)-394-2439

Email: Clifford.Bienert@sdsmt.edu

Dr. Scott J. Kenner, P.E., Department Head

Department of Civil and Environmental Engineering

Civil/Mechanical 122

(605) 394-2513

E-mail: Scott.Kenner@sdsmt.edu

Construction Engineering and Management Certificate

The Construction Engineering and Management Certificate is designed to provide a program of advanced study for candidates anticipating a managerial career in the construction industry. In addition to course delivery in distance mode, flexibility is built into the program to provide an optimum educational experience for working students.

Degree requirements

Distribution of credits

Core requirements: 0 credits

Research or project requirements: 0 credits

Elective requirements: 12 credits

Total credits: 12

All credits must be taken from the courses approved for the certificate.

Core requirements

No specific courses are required for this certificate.

Research or project requirements

There is no research or project requirement for this certificate.

Elective requirements

This certificate requires a total of 12 credits of coursework to be selected by the student in consultation with the student's advisor and from the list of approved certificate courses below. The courses taken must meet these criteria:

- All courses must be SD Mines CEM graduate coursework. No transfer credit will be allowed.
- No credit hours may be CEM 691 or CEM 791.
- Undergraduate courses (400 level and below) will not count toward the certificate.

These CEM courses are available in person or in distance format:

- CEM 574 Construction Engineering and Management **Credits: (3-0) 3**
- CEM 608 Construction Contracts **Credits: (3-0) 3**
- CEM 610 Construction Project Management **Credits: (3-0) 3**
- CEM 612 Construction Estimating **Credits: (3-0) 3**
- CEM 614 Construction Project Scheduling **Credits: (3-0) 3**
- CEM 615 Engineering and Construction Ethics **Credits: (3-0) 3**
- CEM 616 Codes and Standards **Credits: (3-0) 3**
- CEM 619 Construction Company Management **Credits: (3-0) 3**
- CEM 620 Leading and Managing Design Organizations **Credits: (3-0) 3**
- CEM 640 Temporary Structures **Credits: (3-0) 3**
- CEM 665 Construction Equipment Management **Credits: (3-0) 3**
- CEM 706 Managing Sustainable Projects **Credits: (3-0) 3**
- CEM 710 Advanced Construction Management **Credits: (3-0) 3**
- CEM 715 Construction Operations **Credits: (3-0) 3**
- CEM 750 Environmental Permitting **Credits: (3-0) 3**
- CEM 751 Construction Stormwater Management **Credits: (3-0) 3**

Note that 700 level courses are not available to undergraduate students.

Examinations

No final degree examination is required for the certificate. Individual courses may hold final examinations as part of the course.

Additional requirements

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Engineering Management and Leadership Certificate

Contact Information

Paula Jensen

Lecturer

Department of Industrial Engineering

LIB 139

(605) 394-1770

E-mail: Paula.Jensen@sdsmt.edu

Program Information

This is an undergraduate certificate program intended for students enrolled in majors other than Industrial Engineering and Engineering Management. It is intended to provide some basic understanding of engineering management and leadership to students who wish to eventually pursue managerial positions.

Application Procedures

Students should contact the program coordinator for the application procedure and appropriate forms.

Certification Check

Once an application is filed, it is included in the degree audit form. It is the responsibility of the student's advisor to certify certification completion along with the final degree audit.

Certificate Requirements

- IENG 302 Engineering Economics **Credits: (3-0) 3**
- IENG 366 Engineering Management **Credits: (3-0) 3**

Elective Courses (6 credits required)

- IENG 215 Cost Estimating for Engineers **Credits: (3-0) 3**
- IENG 352 Creativity and Innovation **Credits: (1-0) 1**
- IENG 353 Commercialization of New Technology **Credits: (1-0) 1**
- IENG 354 Marketing Technology Innovations **Credits: (1-0) 1**
- IENG 355 Financing Technology Innovations **Credits: (1-0) 1**
- IENG 356 Technology Start Ups **Credits: (1-0) 1**
- IENG 451/451L Operational Strategies/Lab **Credits: (2-1) 3**
- PSYC 331 Industrial and Organizational Psychology **Credits: (3-0) 3**
- MEM 466 Mine Management **Credits: (2-0) 2**

Occupational Safety Certificate

Contact Information

Dr. Adam Piper

Associate Professor

Department of Industrial Engineering

LIB 130

(605) 394-1930

E-mail: Adam.Piper@sdsmt.edu

Occupational Safety Certificate

The graduate level Occupational Safety Certificate at SDSM&T is designed to respond to a business need across all sectors (including general industry, construction, mining, health care, service, etc.) that places occupational safety at the highest level of organizational priorities. Courses are offered on-campus and it is also possible to complete the certificate online.

Degree requirements

Distribution of credits

Core requirements: 6 credits

Research or project requirements: 0 credits

Elective requirements: 3 credits

Total credits: 9

For the graduate certificate 400/500 level courses must be taken at the 500 level.

Core requirements

A total of 6 core credits are required.

- ENGM 650 Safety Management **Credits: (3-0) 3**

One of these core electives must also be taken:

- BME 606 Occupational Biomechanics **Credits: (3-0) 3**
- ENGM 655 Ergonomics for Managers **Credits: (3-0) 3**
- IENG 431/531 Industrial Hygiene **Credits: (3-0) 3**

Research or project requirements

There is no research or project requirement for this certificate.

Elective requirements

At least 3 credits of electives must be selected from this list or from the core electives listed above.

- AES 405/505 Air Quality **Credits: (3-0) 3**
- BME 602 Anatomy and Physiology for Engineers **Credits: (3-0) 3**
- CBE 455/555 Pollution Phenomena and Process Design **Credits: (3-0) 3**
- ENGM 791 Independent Study **Credits: 1 to 3**
- MEM 440/540 Advanced Mine Ventilation and Environmental Engineering **Credits: (3-0) 3 ***
 - * With significant safety content and pre-approved by the certificate coordinator.

Examinations

No final degree examination is required for the certificate. Individual courses may hold final examinations as part of the course.

Additional requirements

A Certificate of Occupational Safety must be approved by the student's graduate advisor and the certificate coordinator on a form available at the Office of the Registrar and Academic Services or from the certificate coordinator. Additional information may be found at the Industrial Engineering Department website ie.sdsmt.edu.

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Six Sigma Greenbelt Certificate

Contact Information

Paula Jensen

Lecturer

Department of Industrial Engineering

LIB 139

(605) 394-1770

E-mail: Paula.Jensen@sdsmt.edu

Program Information

This is an undergraduate and graduate certificate program that will provide a Six Sigma Greenbelt Certification for students interested in process improvement and quality control. Six Sigma certification is strongly valued by many organizations in industry for its standardized problem-solving process and adherence to statistically rigorous quality tools.

Application Procedures

Students should contact the program coordinator for the application procedure and appropriate forms.

Certification Check

Once an application is filed, it is included in the degree audit form. It is the responsibility of the student's advisor to certify certification completion along with the final degree audit.

Program Requirements

Probability and Statistics Requirement

- IENG 381 Introduction to Probability and Statistics **Credits: (3-0) 3**
OR
- MATH 281 Introduction to Statistics **Credits: (3-0) 3**

Quality Requirement

- IENG 486 Statistical Quality and Process Control **Credits: (3-0) 3**
OR
- ENGM 620 Quality Management **Credits: (3-0) 3**
OR
- ENGM 621 Statistical Process Control **Credits: (3-0) 3**

Six Sigma Philosophy Requirement

- IENG 451/451L Operational Strategies/Lab **Credits: (2-1) 3**

Technology Innovation Certificate

Contact Information

Dr. Stuart D. Kellogg

Professor

Department of Industrial Engineering

LIB 144

(605) 394-6152

E-mail: Stuart.Kellogg@sdsmt.edu

Application Procedures

Students should contact the program coordinator for the application procedure and appropriate forms.

Certification Check

Once an application is filed, it is included in the degree audit form. It is the responsibility of the student's advisor to certify certification completion along with the final degree audit.

Program Requirements

The courses that are to be used to meet the requirements for the Technology Innovation Certificate are:

Required Courses

Must complete all listed:

- IENG 352 Creativity and Innovation **Credits: (1-0) 1**
- IENG 353 Commercialization of New Technology **Credits: (1-0) 1**
- IENG 354 Marketing Technology Innovations **Credits: (1-0) 1**
- IENG 355 Financing Technology Innovations **Credits: (1-0) 1**
- IENG 356 Technology Start Ups **Credits: (1-0) 1**

Finance and Budgets Requirements

Must complete at least 3 credits from:

- IENG 215 Cost Estimating for Engineers **Credits: (3-0) 3**
- ENGM 661 Engineering Economics for Managers **Credits: (3-0) 3**

Product Development Requirements

Must complete at least 2 credits from:

- EE 264L Electromechanical Systems Product Development and Design Lab **Credits: (0-2) 2**
- ME 264L Electromechanical Systems Product Development and Design Lab **Credits: (0-2) 2**
- ENGM 625 Innovation and Commercialization **Credits: (3-0) 3**

Elective Courses

Must complete at least 3 credits from:

- BADM 336 Entrepreneurship **Credits: (3-0) 3 ***
- BADM 438 Entrepreneurship II **Credits: (3-0) 3 ***
- BADM 489 Business Plan Writing and Competition **Credits: (1-0) 1 ***
- BADM 370 Marketing **Credits: (3-0) 3 ***
- IENG 366 Engineering Management **Credits: (3-0) 3**
- ENGM 640 Business Strategy **Credits: (3-0) 3**
- BADM 310 Business Finance **Credits: (3-0) 3 ***
- BADM 350 Legal Environment of Business **Credits: (3-0) 3 ***
- BADM 360 Organization and Management **Credits: (3-0) 3 ***

*These courses are currently offered through BHSU, SDSU, and USD

Geospatial Technology- Undergraduate Certificate

Contact Information

Mr. Curtis Price, Lecturer

Department of Geology and Geological Engineering
South Dakota School of Mines & Technology
MI-301
605-394-2461
E-mail: Curtis.Price@sdsmt.edu

For more information on this certificate see the Department of Geology and Geological Engineering page under Undergraduate Studies in this catalog.

Program Requirements

The certificate consists of four required courses. Students who have not yet achieved a bachelor's degree will take the undergraduate (400 level) courses; students holding a bachelor's degree may enroll in the graduate (500 level) courses. The two levels are offered simultaneously in the same classroom, but additional requirements and expectations pertain to students enrolled at the graduate level.

At least 9 credits of the certificate must be taken from the South Dakota School of Mines and Technology. A grade of "C" or better must be earned in every course, in order to receive the certificate.

- GEOL 416/416L/516/516L Introduction to GIS/Lab **Credits: (2-1) 3**
- GEOL 417/517 Geospatial Databases **Credits: (3-0) 3**
- GEOL 419/519 Advanced Geospatial Analysis **Credits: (3-0) 3**
- GEOL 420/520 Introduction to Remote Sensing **Credits: (3-0) 3**

Geospatial Technology- Graduate Certificate

Contact Information

Mr. Curtis Price, Lecturer

Department of Geology and Geological Engineering

South Dakota School of Mines & Technology

MI-301

605-394-2461

E-mail: Curtis.Price@sdsmt.edu

Certificate in Geospatial Technology

The certificate consists of four required core courses. Students who have not yet achieved a bachelor's degree will take the undergraduate (400 level) courses; students holding a bachelor's degree may enroll in the graduate (500 level) courses. The two levels are offered simultaneously in the same classroom, but additional requirements and expectations pertain to students enrolled at the graduate level.

Certificate requirements

Distribution of credits

Core requirements: 12 credits

Research or project requirements: 0 credits

Elective requirements: 0 credits

Total credits: 12

Core requirements

- GEOL 416/416L/516/516L Introduction to GIS/Lab **Credits: (2-1) 3**
- GEOL 417/517 Geospatial Databases **Credits: (3-0) 3**
- GEOL 419/519 Advanced Geospatial Analysis **Credits: (3-0) 3**
- GEOL 420/520 Introduction to Remote Sensing **Credits: (3-0) 3**

Research or project requirements

No research or project credits are required for this certificate. Individual courses may require projects as part of the course.

Elective Requirements

No electives are required for this certificate.

Examinations

No final degree examination is required for the certificate. Individual courses may hold final examinations as part of the course.

Additional requirements

- At least 9 credits of the certificate must be taken from the South Dakota School of Mines and Technology.
- A grade of "C" or better must be earned in every course in order to receive the certificate.

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

Global Engineering Certificate

Contact Information

Dr. Jennifer Benning

Associate Professor

Department of Civil and Environmental Engineering

Civil/Mechanical 241

(605) 394-2425

E-mail: Jennifer.Benning@sdsmt.edu

Program Information

Many engineers encounter projects in unfamiliar cultures and work on multinational teams. The Certificate in Global Engineering provides cross cultural insight and experience that will increase the ability of engineers to work on projects and teams in other countries and cultures. Students learn advanced intercultural communication and teaming skills, and then complete a cross cultural design project while working on multinational teams, or by working on a project in Latin America, Asia or Africa or in a Native American community for example.

Students from any engineering discipline at the School of Mines may pursue the Certificate in Global Engineering by completing 9 credit hours of coursework as described below.

Certificate Requirements

Cross Cultural Engineering Design

Students must complete a 3 credit cross cultural engineering design activity (e.g., an approved design project, co-op, or engineering design course in a foreign culture or country.)

- CP 297/397/497 Cooperative Education **Credits: 1 to 3**
- EXPL 285/385/485/585/685 Study Abroad Experiences **Credits: 1 to 3**
- EXCH 289 Student Exchange - International **Credits: 0 to 18**
- EXCH 389 Student Exchange - International **Credits: 0 to 16**
- EXCH 489 Student Exchange - International **Credits: 0 to 18**
- CEE 498 Undergraduate Research/Scholarship **Credits: 1 to 6**
- CEE 491 Independent Study **Credits: 1 to 3**

Cross Cultural Communication

Students must complete 3 credits from the following list of courses to expand their understanding of human nature, social systems, or cross cultural communication in a global context.

- SOC 100 Introduction to Sociology **Credits: (3-0) 3**
- GEOG 400 Cultural Geography **Credits: (3-0) 3**
- POLS 250 Introduction to International Relations **Credits: (3-0) 3**
- POLS 350 International Relations **Credits: (3-0) 3**
- ANTH 210 Cultural Anthropology **Credits: (3-0) 3**

Cross Cultural Teamwork or Project Management

Students must complete 3 credits from the following courses to improve their understanding in cross cultural teamwork or project management.

- CEE 474/574 Construction Engineering and Management **Credits: (3-0) 3**
- MSL 201 Innovative Team Leadership **Credits: (1-0) 1**
- IENG 352 Creativity and Innovation **Credits: (1-0) 1**
- IENG 366 Engineering Management **Credits: (3-0) 3**
- PSYC 319 Teams and Teaming **Credits: (1-0) 1**
- PSYC 331 Industrial and Organizational Psychology **Credits: (3-0) 3**

Petroleum Systems Certificate

Contact Information

Dr. Laurie Anderson, Department Head

Department of Geology and Geological Engineering

Mineral Industries 303

(605) 394-2461

E-mail: Laurie.Anderson@sdsmt.edu

Certificate in Petroleum Systems

The Petroleum Systems Certificate Program has a geoscience focus and is geared toward graduate students and professionals who are looking to expand their skill sets in petroleum and related fields, or who are looking to retool and retrain for a new career.

Requirements for the certificate

Distribution of credits

Core requirements: 0 credits

Research or project requirements: 0 credits

Elective requirements: 12 credits

Total credits: 12

Core requirements

No specific courses are required for this certificate.

Research or project requirements

No research or project credits are required for this certificate. Individual courses may require projects as part of the course.

Elective requirements

The program requires completion of 12 credits of coursework selected from this approved list. Cross-listed 400/500 level courses must be taken at the 500 level.

- GEOE 412/512 Science and Engineering Field Applications **Credits: 3 to 6**
- GEOE 461/561 Petroleum Drilling and Production Engineering **Credits: (3-0) 3**
- GEOE 462/462L/562/562L Well Log Analysis/Laboratory **Credits: (2-1) 3**
- GEOE 467/567 Introduction to Geomechanics **Credits: (3-0) 3**
- GEOL 422/422L/522/522L Tectonics and Sedimentary Basin Analysis/Lab **Credits: (2-1) 3**
- GEOL 476/576 Petroleum Geology **Credits: (3-0) 3**
- GEOL 632 Rocky Mountain Stratigraphy **Credits: (3-0) 3**
- GEOL 725 Geodynamics **Credits: (3-0) 3**

Examinations

No final degree examination is required for the certificate. Individual courses may hold final examinations as part of the course.

Additional requirements

- At least 9 credits of the certificate must be taken from the South Dakota School of Mines and Technology.
- A grade of "C" or better must be earned in every course in order to receive the certificate.

In addition to these degree-specific requirements, the student must also meet the requirements and policies applied to all graduate degrees by the Council of Graduate Education.

eSports (Electronic Sports) Certificate

Contact Information

Dr. John R. Dreyer
Political Science
Classroom Building, Office 322
John.Dreyer@sdsmt.edu

Program Information

The eSports certificate is designed to deepen knowledge of on-line gaming, simulation and the recent and highly competitive world of professional gaming. The certificate program is designed to provide STEM students with competencies and skill-sets associated with eSports, including computer programming, art and graphics, human factors, and skills in leadership and teaming. The overarching goal of the certificate program is to encourage STEM graduates to develop the workplace skills generated from a deeper understanding of the elements of eSport activities.

The eSports certificate supports the development of professional attributes, such as emotional intelligence, teaming, and communication. The goal of this certificate is to develop co-curricular activities, social events, and competitions to support the development of such attributes. This certificate is intended to align with a student's degree program and extra-curricular activities in order to cultivate professional attributes through the study and practice of eSports. Leadership, teamwork, and an increasingly online work environment are all qualities that the student will address in completing their eSports coursework.

Program Requirements

Students must successfully complete a minimum of 12 credit hours, including HUM 376, with a grade of C or better to earn the eSports Certificate. HUM 376 is required of all students.

Overview Course: Required of all students

- HUM 376 E-Sports and Simulations: Overview **Credits: (1-0) 1**

Computer Programming:

Students must complete at least 2 credit hours from the following:

- CSC 150/150L Computer Science I/Lab **Credits: (2-1) 3**
OR
- CSC 170/170L Programming for Engineers and Scientists **Credits: (3-0) 3**
OR
- CBE 117L Programming for Chemical and Biological Engineering **Credits: (0-1) 1**
AND
- CBE 250 Computer Applications in Chemical Engineering **Credits: (2-0) 2**

Social Sciences:

Students must complete 3 credit hours from the following:

- SOC 100 Introduction to Sociology **Credits: (3-0) 3**
OR
- PSYC 101 General Psychology **Credits: (3-0) 3**

Human Factors:

Students must complete 3 credit hours from the following:

- IENG 321/321L Ergonomics/Human Factors Engineering/Lab **Credits: (2-1) 3**
OR
- HUM 375 Computers in Society **Credits: (3-0) 3**

Art and Graphics:

Students must complete at least 2 credits from the following:

- IENG 248/248L Engineering Graphics and Computer Modeling **Credits: (1-1) 2**
- CEE 117/117L Introduction to CADD/Lab **Credits: (1-1) 2**