

# Bachelor of Science in Geological Engineering

Required 128 credits (36 of which must be numbered 300 or above) including:

I. Essential Studies Requirements (see University ES listing).

II. Geological Engineering required courses

Code	Title	Credits
<b>Geological Engineering required courses</b>		
GEOE 203 & 203L	Earth Dynamics and Earth Dynamics Laboratory	4
GEOE 301 & 301L	Petrophysics and Petrophysics Laboratory	4
GEOE 323	Engineering Geology	2
GEOE 412	Soil Mechanics	3
GEOE 417	Hydrogeology	3
GEOE 455	Geomechanics	3
GEOE 455L	Geomechanics Laboratory	1
GEOE 484	Geological Engineering Design	3
GEOE 485	Geological Engineering Design	3
GEOE 410 Field Camp*		6
<b>Geology required courses</b>		
GEOL 414	Applied Geophysics	3
GEOL 356	Geoscience Lectures	1
GEOL 330 & 330L	Structural Geology and Structural Geology Laboratory	4
GEOL 421	Seminar	1
GEOL 422	Seminar II	1
GEOL 312 & 312L	Sedimentology and Stratigraphy and Sedimentology and Stratigraphy Lab	4
<b>Total Credits</b>		<b>46</b>

III. Program Required Electives

Code	Title	Credits
<b>Elective course options</b>		
<b>8</b>		
GEOE 418	Hydrogeological Methods	
GEOE 419	Groundwater Monitoring and Remediation	
GEOE 420	Geological Modeling and Numerical Simulation of Reservoirs	
GEOE 425	Design Hydrology for Wetlands	
GEOE 427	Groundwater Modeling	
GEOE 493	Selected Topics in Geological Engineering	
GEOL 311	Geomorphology	
GEOL 321	Geochemistry	
GEOL 407	Petroleum Geology	
GEOL 491	Geologic Problems (only section)	
CE 414	Foundation Engineering	
CE 421	Hydrology	
CE 431	Principles of Water and Wastewater Treatment	
CE 432	Environmental Engineering Design	
PTRE 311	Petroleum Fluid Properties	
PTRE 401	Well Logging	
PTRE 411	Drilling Engineering	
PTRE 421	Production Engineering	
PTRE 431	Reservoir Engineering	
GEOE 421	Cold Region Hydrologic Modeling	
<b>Total Credits</b>		<b>8</b>

IV. College of Engineering and Mines requirements

Code	Title	Credits
ENGR 200	Computer Applications in Engineering	2
ENGR 201	Statics	3
ENGR 203	Mechanics of Materials	3
ENGR 206 or ENGR 202	Fundamentals of Electrical Engineering Dynamics	3
ENGR 340	Professional Integrity in Engineering	3
ENGR 460	Engineering Economy	3
CE 306 or ME 306	Fluid Mechanics	3
ME 341	Thermodynamics	3
<b>Total Credits</b>		<b>23</b>

V. Requirements outside of the College of Engineering and Mines

Code	Title	Credits
CHEM 121 & 121L	General Chemistry I and General Chemistry I Laboratory	4
CHEM 122 & 122L	General Chemistry II and General Chemistry II Laboratory	4
MATH 165	Calculus I	4
MATH 166	Calculus II	4
MATH 265	Calculus III	4
MATH 266	Elementary Differential Equations	3
PHYS 251 or PHYS 251C & 251CL	University Physics I and University Physics I Lab	4
PHYS 252 or PHYS 252C & 252CL	University Physics II and University Physics II Lab	4
ECON 210 or MATH 321	Introduction to Business and Economic Statistics Applied Statistical Methods	3
<b>Total Credits</b>		<b>34</b>

\* GEOE 410 Field Camp is a course that is completed through South Dakota School of Mines & Technology. Students should take the course through them and transfer the course back to UND.

\*\* Students may petition the Geological Engineering Curriculum Committee (GECC) to use GEOE 397 Cooperative Education for up to three credits applied towards Technical Electives, based on the following requirements:

1. Students must get approval in advance from the GECC and the Department Cooperative Coordinator.
2. The first cooperative experience may receive up to one credit of technical elective credit.
3. The second cooperative experience may receive up to two credits of technical elective credit.

\*\*\*Students must ensure all appropriate pre-requisites are met prior to registering for all courses in the curriculum.

## Geotechnical Engineering Concentration

Geotechnical Engineering is a branch of geological engineering and civil engineering that deals with the behavior of soils and rocks, and the design and analysis of natural and man-made soil structures. The classes of problems related to geotechnical engineering include foundations, slope stability, soil dynamics, soil improvement, geoenvironmental problems, geosynthetics, seepage, tunneling, mining and energy geotechnics. Many construction projects are conducted on less than ideal ground conditions that need to be improved by geotechnics. Construction of infrastructures and residential buildings may encounter unstable slopes or deep excavation. The retaining structures are often used to stabilize them. In some cases, modern reinforced soil technologies are used. Geotechnical engineers are today mandated to design foundations and soil structures that ensure stability and satisfactory

performance under the impact of natural disasters, such as earthquakes and hurricanes. The concentration in geotechnical engineering is designed to prepare students for careers in geotechnical engineering.

This concentration requires students to complete all of the courses from the list shown below.

Code	Title	Credits
GEOE 323	Engineering Geology	2
GEOE 412	Soil Mechanics	3
GEOE 454	Unsaturated Soil Mechanics	3
GEOE 455 & 455L	Geomechanics and Geomechanics Laboratory	4
GEOE 456	Geomaterials Stabilization	3
CE 414	Foundation Engineering	3
<b>Total Credits</b>		<b>18</b>

Code	Title	Credits
GEOE 417	Hydrogeology	3
GEOE 419	Groundwater Monitoring and Remediation	3
GEOE 421 or CE 421	Cold Region Hydrologic Modeling Hydrology	3
GEOL 321	Geochemistry	3
GEOL 342	Conservation and Environmental Hydrology	3
GEOL 540	Water Sampling and Analysis	3

## Petroleum Concentration

The program has a petroleum option, that is designed to prepare students for possible employment in the petroleum industry, while continuing to provide a broad geological engineering background for career flexibility. The undergraduate pursuing this emphasis will have a B.S. in Geological Engineering and their transcript will show that they have completed the Petroleum Geology Concentration.

This concentration requires students to complete at least 16 credits from the course list shown below:

Code	Title	Credits
GEOE 301 & 301L	Petrophysics and Petrophysics Laboratory	4
GEOE 455 & 455L	Geomechanics and Geomechanics Laboratory	4
GEOE 420	Geological Modeling and Numerical Simulation of Reservoirs	3
GEOE 591	Advanced Subsurface Energy Recovery in Engineering	3
GEOL 407	Petroleum Geology	3
GEOL 500	Sedimentary Geology	1-4
PTRE 401	Well Logging	3

## Water Resources Concentration

Freshwater is a vital resource for economic growth, global ecosystems and well-being of human lives. Recently water resources are also severely under pressure across the world due to substantial population growth and migration, climate and land-use changes, and anthropogenic pollutions. Water security and quality are increasingly also recognized as a critical national security priority. Moreover, water management is becoming increasingly complex and complicated, demanding a thorough and sound understanding of hydrologic and hydrogeologic processes and their vulnerabilities to climate, land-use changes and anthropogenic usages. These interactions require the skills in visualizing and understanding water and contaminant transport through subsurface rocks (sedimentary, igneous and metamorphic) and surface waterways. The range of typical applications is wide and the methods used are diverse. Expertise provided by this concentration includes aspects of hydrogeology, groundwater contamination and remediation, water quality and lab analyses and cold region hydrology. This expertise is highly sought after by industries and government agencies that deal with critical water resources and environmental problems. Furthermore, it has become equally important to train replacements for an aging workforce in this important technological area. The concentration in Water Resources is designed to prepare students for careers such as hydrogeologist, hydrologist, environmental geologist and environmental engineer.

This concentration requires students to complete 16 credits from the list shown below: