Bachelor of Science in Chemical Engineering

Required 130 credits (36 of which must be numbered 300 or above) including:

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

II. Chemical Engineering required courses

Code	Title	Credits
CHE 102	Introduction to Chemical Engineering	2
CHE 103	Computing Tools for Chemical Engineers	3
CHE 201	Chemical Engineering Fundamentals *	3
CHE 206	Unit Operations in Chemical Engineering **	3
CHE 232	Chemical Engineering Laboratory I ††	2
CHE 301	Introduction to Transport Phenomena	4
CHE 303	Chemical Engineering Thermodynamics	4
CHE 305	Separations **	3
CHE 315	Engineering Statistics and Design of Experiments	3
CHE 321	Chemical Engineering Reactor Design **	3
CHE 331	Chemical Engineering Laboratory II ††	2
CHE 332	Chemical Engineering Laboratory III ††	2
CHE 408	Process Dynamics and Control	3
CHE 411	Plant Design I: Process Design and Economics **	4
CHE 412	Plant Design II: Process Project Engineering **, †	5
CHE 416	Chemical Product Design	3
CHE 431	Chemical Engineering Laboratory IV **	3
Total Credits		**52**

III. Program Required Electives

Code	Title	Credits
Advanced Chemical Science elective §		**6**
Material Science Elective		**3**
CHE 435	Materials and Corrosion	
CHEM 475	Materials Chemistry	
ENGR 203	Mechanics of Materials	
ME 301	Materials Science	
Technical Elective §		**3**
Total Credits		**12**

III. College of Engineering and Mines requirements

Code	Title	Credits
ENGR 206	Fundamentals of Electrical Engineering	3
ENGR 340	Professional Integrity in Engineering	3
Total Credits		**6**

IV. Requirements outside of the College of Engineering and Mines

Code	Title	Credits
CHEM 221 & 221L	Fundamentals of Chemistry - Concepts and Fundamentals of Chemistry Laboratory *	4
or CHEM 121 & 121L	General Chemistry I and General Chemistry I Laboratory	
CHEM 254 & 254L	Inorganic Chemistry I and Inorganic Chemistry I Laboratory *	4
or CHEM 122 & 122L	General Chemistry II and General Chemistry II Laboratory	
CHEM 340 & 340L	Survey of Organic Chemistry and Survey of Organic Chemistry Laboratory	5
or CHEM 341 & 341L	Organic Chemistry I and Organic Chemistry I Laboratory	
CHEM 466	Fundamentals of Physical and Biophysical Chemistry	3
or CHE 403	Molecular Thermodynamics and Kinetics	
MATH 165	Calculus I *	4
MATH 166	Calculus II *	4
MATH 265	Calculus III *	4
MATH 266	Elementary Differential Equations	3
PHYS 251	University Physics I	4
PHYS 252	University Physics II	4
LEAD 101	Learning Leadership	3
Total Credits		**42**

* Must be completed with a grade of C or better prior to enrollment in Junior-level ChE courses.

** Must be completed at UND.

††CHE 235 Chemical Engineering Summer Laboratory I and CHE 335 Chemical Engineering Summer Laboratory II may be taken in lieu of the CHE 232 Chemical Engineering Laboratory I, CHE 331 Chemical Engineering Laboratory II, CHE 332 Chemical Engineering Laboratory III sequence.

† CHE 413/CHE 414 may be taken in lieu of CHE 412.

§ A list of currently recommended courses for the **Advanced Chemical Science Elective** and **Technical Elective** categories is available from the Chemical Engineering Department, but other courses may be accepted with approval from the department. **Advanced Chemical Science** courses must include a significant chemistry component at a level beyond general chemistry. **Technical Elective** courses can be taken from a broad range of disciplines including math, science, and engineering, as well as management, marketing, and finance, and are generally upper level courses.

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

The following optional concentrations may be added based on student interest:

Concentration in Energetics

Energetics concepts are widely used in defense applications, as well as many other areas including space exploration, counter-terrorism, fire suppression and public safety technologies, automotive airbags, and fireworks. With defense and security representing important issues facing our nation today, there is a critical need to grow and optimize the research and development of energetic materials. Furthermore, it has become equally important to train replacements for the aging workforce in this important technological area. This program is designed to equip students for careers associated in energetics, conduct research and development activities, or to pursue advanced studies in technologies that will meet the demands of the space and defense industries in the future.

To qualify for a Concentration in Energetics, a student must complete the requirements for the B.S. in Chemical Engineering. Requirements for the concentration are fulfilled by taking the following courses to meet the required electives of the B.S. ChE degree. In addition, one additional credit is required for the concentration: CHE 422 Capstone in Energetics.

Code	Title	Credits
Essential Studies Elective (select one of the following):		3
ANTH 171	Introduction to Cultural Anthropology	
CJ 201	Introduction to Criminal Justice	
GEOG 161	World Regional Geography	
PHIL 130	Introduction to Political Philosophy	
POLS 220	International Politics	
POLS 225	Comparative Politics	
SOC 115	Social Problems	
Other as approved by department		
Technical Elective:		3
CHE 531	Rocket Propulsion	
Advanced Chemical Science Electives:		6
CHE 532	Explosives: Theory and Modeling	
CHE 530	Combustion Theory and Modeling	

Materials Science Elective:		3
CHE 535	Metallic Corrosion and Polymer Degradation	
Capstone:		
CHE 422	Capstone in Energetics	1
Total Credits		**16**

The student's transcript will be marked by a Concentration in Energetics upon completion of the recommended curriculum.

Concentration in Sustainability

Climate change, rising energy costs, and water-energy-food security represent some of the most significant issues facing today's society. It will take major advances in technology to help resolve these issues. Additionally, energy-related issues have created a new industry with a strong need for the training and development of human capital. The concentration in Sustainability is designed to help students prepare themselves for careers associated with sustainability and sustainable energy technologies.

To qualify for a concentration in Sustainability, a student must complete the requirements for the B.S. in Chemical Engineering. Requirements for the concentration are fulfilled by taking the following courses to meet the required electives of the B.S. ChE degree. In addition, one additional credit is required for the concentration: CHE 420 Capstone in Sustainable Energy.

Code	Title	Credits
Essential Studies Elective (Choose one of the following):		3
ESSP 160	Sustainability Society	
PHIL 253	Environmental Ethics	
other courses as approved by department		
Material Science Elective:		3
CHE 435	Materials and Corrosion	
Technical Elective (select one of the following):		3
CHE 404	Air Emissions: Regulation and Control	
CHE 503	Fuels Technology	
EE 522	Renewable Energy Systems	
ESSP 503	Environmental Policy Science	
ESSP 505	Energy Issues and Earth Systems	
ESSP 507	Earth Systems Processes and Vulnerability Analysis	
ESSP 562	Environmental Economics, Policy and Management	
Advanced Chemical Science Electives (Select two of the following):		6
CHEM 333 & 333L	Analytical Chemistry and Analytical Chemistry Laboratory	
CHE 480	Undergraduate Research	
CHE 505	Biochemical and Biomaterial Engineering	
CHE 530	Combustion Theory and Modeling	
Capstone:		1
CHE 420	Capstone in Sustainable Energy	
Total Credits		**16**

The student's transcript will be marked with a Concentration in Sustainability upon completion of the recommended curriculum.

Concentration in Petroleum Engineering

This program is designed to equip students for careers in Petroleum Engineering with an emphasis on the upstream development, drilling and production of oil and natural gas. Students will also be prepared to conduct research and development activities or to pursue advanced studies in technologies that will meet the demands of upstream oil production.

To qualify for a Concentration in Petroleum Engineering, a student must complete the requirements for the B.S. in Chemical Engineering. Requirements for the concentration are fulfilled by taking the following courses to meet the required electives of the B.S. ChE degree. In addition, one additional credit is required for the concentration: CHE 424 Capstone in Petroleum Engineering.

Code	Title	Credits
Essential Studies Elective (choose one of the following):		3
ESSP 160	Sustainability Society	
PHIL 253	Environmental Ethics	
others as approved by department		
Technical Elective		3
PTRE 411	Drilling Engineering	
Advanced Chemical Science Electives		6
PTRE 421	Production Engineering	
PTRE 431	Reservoir Engineering	
Materials Science Elective (Select one of the following):		3
CHE 435	Materials and Corrosion	
CHEM 475	Materials Chemistry	
ENGR 203	Mechanics of Materials	
Capstone:		1
CHE 424	Capstone in Petroleum Engineering	
Total Credits		**16**

The student's transcript will be marked by a Concentration in Petroleum Engineering upon completion of the recommended curriculum.