

ENGINEERING

TRANSFER

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The engineering curriculum at BSC provides students with basic courses in science, mathematics and other areas required by most engineering schools. Students who complete the requirements receive an Associate in Science degree, and are ready to transfer to the engineering college of their choice with junior standing.

Through agreements between BSC and the University of North Dakota and between BSC and North Dakota State University, BSC engineering students may transfer to either university to compete equally with juniors enrolled at UND or NDSU for scholarships and class registration. Students should apply for joint admission to BSC and the engineering program at the university of their choice (UND or NDSU) to facilitate the transfer process. For complete details, contact the associate professor of engineering.

One of the strengths of BSC's engineering curriculum is that students have two options for completion of the curriculum. Those who need to review math and science skills necessary to succeed in engineering may choose Option 2, which may take three years to complete. Students who have taken college preparatory courses and who are ready to enroll in calculus and chemistry may choose Option 1. The suggested curriculum for both options is listed below.

Careers and work activities of engineers vary widely. Among the numerous branches of engineering are: agricultural, chemical, civil, construction, electrical and electronic, geological, industrial, mechanical, transportation, bio-engineering and construction management.

Work activities of engineers may include research, design, sales, manufacturing, testing, installation, development, teaching, consulting, business and management.

Engineers should have an analytical mind, the capacity for detail, creativity, be able to work as part of a team, and be able to express themselves both orally and in writing.

High school students planning to major in engineering should study physics, chemistry, and as much math as possible. Because of the strong emphasis on computer applications in all fields of engineering, students should be proficient at keyboarding. Knowledge of word processing, spread sheets, and computer programming is also helpful.

Students should refer to the catalog of the school where they plan to complete their bachelor's degree requirements and modify this curriculum if necessary.

Career Possibilities: Engineer (several fields), Research and Design Engineer, Engineering Management.

It's strongly recommended that students see an adviser before registering for classes. An adviser will help with your schedule of classes based on your chosen field of engineering and the school where you plan to complete a bachelor's degree. The adviser will help you modify this suggested curriculum, if necessary.

SUGGESTED CURRICULUM FOR ASSOCIATE IN SCIENCE:

OPTION 1 - TWO YEARS

*FRESHMAN	CREDITS
College Composition I-II, Intro. to Professional Writing (ENGL 110 and 120 or 125)	6
Calculus (MATH 165-166)	8
General Chemistry I&II (CHEM 121-122).....	8
General Chemistry I&II Lab (CHEM 121L-122L)	2
Graphical Communications (ENGR 101).....	3
Arts and Humanities Electives.....	6
Enrichment	2
Total credits.....	35

SOPHOMORE	CREDITS
University Physics I-II (PHYS 251-252).....	8
University Physics I-II Lab (PHYS 251L-252L).....	2
Calculus (MATH 265).....	4
Intro. to Differential Equations (MATH 266)	3
Applied Linear Algebra (MATH 227).....	3
Statics (ENGR 201)	3
Engineering Electives	6-8
Social Science Electives	6
Fundamentals of Public Speaking (COMM 110)	3
Total credits.....	38-40

OPTION 2 - TWO OR THREE YEARS

Some students interested in a career in engineering enter college needing to review math and science skills necessary for success in the engineering

field. This option allows students to take preliminary courses in science and to review algebra and trigonometry before enrolling in calculus. Since calculus is crucial for success in physics and sophomore engineering courses, these students may need up to three years of study before they are ready to transfer to an engineering college with junior status.

FIRST YEAR	CREDITS
College Composition I-II, Intro. to Professional Writing (ENGL 110 and 120 or 125)	6
Algebra (MATH 102 or 103)	3
Pre-calculus (MATH 107).....	5
Physical Science I-II (SCNC 101 or 101-102)	3-6
Physical Science I-II Lab (SCNC 101L-102L).....	1-2
Introduction to Computers (CSCI 101).....	3
Keyboarding I (BOTE 102)	3
Arts and Humanities Electives	6
Total credits.....	30-34

SECOND YEAR	CREDITS
Calculus (MATH 165-166)	8
Chemistry (CHEM 115-116 or 121-122)	8
Chemistry Lab (CHEM 115L-116L or 121L-122L)	2
Graphical Communication (ENGR 101)	3
Social Science Electives	6
Enrichment	2
Fundamentals of Public Speaking (COMM 110)	3
Engineering Electives	3-6
Total credits.....	35-38

THIRD YEAR	CREDITS
Calculus (MATH 265).....	4
Intro. to Differential Equations (MATH 266)	3
Applied Linear Algebra (MATH 227).....	3
University Physics I-II (PHYS 251-252)	8
University Physics I-II Lab (PHYS 251L-252L).....	2
Statics (ENGR 201)	3
Engineering Electives	4-6
Total credits.....	27-29

ENGINEERING ELECTIVES	CREDITS
Dynamics (ENGR 202).....	3
Mechanics of Materials (ENGR 203)	3
Surveying I (ENGR 204)	3
Surveying I Lab (ENGR 204L).....	1
Computer Aided Design I (CAD 211)	3
Circuit Analysis (EE 206).....	4
Probability and Statistics (MATH 220).....	3
Organic Chemistry I&II (CHEM 241-242)	8
Organic Chemistry I&II Lab (CHEM 241L-242L)	2
Physical and Historical Geology (GEOL 105-102)	6
Physical and Historical Geology Lab (GEOL 105L-102L).....	2

A complete four-year sample curriculum for each field of engineering offered by the state universities is available from the BSC Engineering Department.

ENGINEERING (CAD, CT, EE, ENGR, ME)

AUTOCAD (CAD)

CAD 211 Computer Aided Design I **F&S** **3 credits**

An introduction to computer-aided graphics, with an emphasis on two-dimensional drawings. Drafting is done with the aid of microcomputers using AutoCAD computer-aided drafting and modeling software. Prerequisite or corequisite: ENGR 101 or instructor approval.

CAD 212 Computer Aided Design II **Fall** **3 credits**

A continuation of CAD I. Isometric and 3-D drawings are introduced. Advanced civil engineering topics, including structural, civil, and pipe drafting. Prerequisite: CAD 211 or instructor approval.

CAD 213 Computer Aided Design III **Fall** **3 credits**
 This course introduces students to the fundamental concepts of civil engineering and surveying 3D software techniques using the AutoCAD Civil3D program. Students learn how to work with point data, how to create and analyze surfaces, how to develop sites, roads, corridors, and pipe networks, how to work with survey data, and how to import and export data. Students will also learn how to create 2D and 3D civil engineering production drawings. Prerequisite: CAD 211 or instructor approval.

CIVIL ENGINEERING AND SURVEYING TECHNOLOGY (CT)

CT 232 Water Management Technology **Spring** **4 credits**
 This course covers the fundamentals of water supply and distribution, water treatment processes, sanitary sewage and collection methods, sewage treatment and the environmental effects caused by improper water and sewage handling. Included in the course are topics on hydraulics, chemical and biological testing, water distribution and collection systems and water and sewage treatment facilities. Prerequisite: MATH 105 or MATH 107.

CT 250 Applied Statics and Mechanics of Materials **Fall** **4 credits**
 Equilibrium of rigid-bodies and coplanar force systems, trusses, load tracing, centroids and centers of gravity, introduction to stress, strain, shear and bending moments, bending stress, shear stress and beam deflections, properties of materials, simple beam and column design, and connections. Prerequisite: MATH 105 or MATH 107.

CT 251 Materials Testing **Spring** **3 credits**
 Introduction to the physical and chemical properties of materials used in civil engineering projects including asphalt, Portland cement, aggregates and soils along with the proper sampling, testing and reporting procedures of these materials. Corequisite: CT 251L. Prerequisite or Corequisite: ENGL 125.

CT 251L Materials Testing Lab **Spring** **1 credit**
 Field and office exercises in the sampling and testing of civil engineering materials. Labs are held at the ND Dept. of Transportation Materials and Research Lab. Corequisite: CT 251.

CT 252 Construction Project Management **Spring** **3 credits**
 An introduction to inspection procedures, management of quality controls of construction projects, estimating, print reading, and procedures used to administer construction specifications and contracts.

ELECTRICAL ENGINEERING (EE)

EE 206 Circuit Analysis **Spring EO** **3 credits**
 Introduction to electric circuit components. Fundamental laws of circuit analysis. Steady state and transient analysis of DC and AC circuits. Electric power calculations. Concurrent registration in EE 206L is required. Prerequisite: ENGR 201.

EE 206L Circuit Analysis Lab **Spring EO** **1 credit**
 One hour of lab per week. Concurrent registration in EE 206 is required.

ENGINEERING (ENGR)

ENGR 101 Graphical Communication **F&S** **3 credits**
 Elementary space visualization of points, lines, planes, and solids on orthogonal projection; graphical expression of technical sketching; geometry; pictorial representation, and size specification; reproduction methods. Computer-aided drafting is introduced. Prerequisite or Corequisite: Math 105 or 107.

ENGR 201 Statics **Fall** **3 credits**
 Vector approach to principles of statics. Resultants of force systems, equilibrium of force systems, analysis of structures, centroids, moments of inertia. Prerequisite or co-requisite: MATH 166.

ENGR 202 Dynamics **Spring** **3 credits**
 Vector approach to principles of dynamics. Rectilinear and curvilinear translation, rotation, plane motion, force-mass-inertia, work-energy, impulse-momentum. Prerequisite: ENGR 201.

ENGR 203 Mechanics of Materials **Spring** **3 credits**
 Simple stress and strain, torsion, shear and bending moment, flexural and shearing stresses in beams, combined stresses, deflection of beams, statically indeterminate members and columns. Prerequisite: ENGR 201.

ENGR 204 Surveying I **Spring** **3 credits**
 Measurements and errors, measurements of distances and angles, differential leveling, traverse surveys, construction surveys, simple horizontal and vertical curves, and earthwork calculations. Prerequisites: MATH 105 or MATH 107 and CAD 211. Corequisite: ENGR 204L.

ENGR 204L Surveying I Lab **Spring** **1 credit**
 Three hours of lab per week. Field and office exercises including data collection and computational techniques of surveying data. Corequisite: ENGR 204.

ENGR 205 Surveying II **Fall** **3 credits**
 Compound and spiral curves horizontal curves, state plane coordinate system, U.S. public land surveys, boundary surveys an introduction to geodetic surveying, electronic data collection and reduction, and astronomical observations. Prerequisite: ENGR 204. Corequisite: ENGR 205L.

ENGR 205L Surveying II Lab **Fall** **1 credit**
Three hours of lab per week. Field and office exercises including data collection and computational techniques of surveying data. Corequisite: ENGR 205.

ENGR 206 Fluid Mechanics **BD** **3 credits**
This course covers fluid properties, fluid statics, fluid dynamics, transport theory and transport analogies, conservation of mass, energy and momentum, dimensional analysis, boundary layer concepts, pipe flows, compressible flow, and open channel flow. Prerequisite: ENGR 201.

ENGR 241 Thermodynamics I **Spring** **3 credits**
Fundamental concepts of thermal energy relationships, processes and cycles are introduced, including: first and second law of thermodynamics, entropy, and availability. Prerequisite: ENGR 201.

ENGR 294 Independent Study **1-3 credits**
Independent or directed study of special topics in engineering. Department chairperson approval is required.

ENGR 299 Special Topics in Engineering **BD** **1-3 credits**
Repeatable up to six semester hours. An examination on of special topics in engineering.

ENGR 195-295 Service Learning **1-3 credits**
Maximum of six semester hours. Service learning may be accomplished by one of three methods: Joining a club that has a public service component, doing volunteer work at a non-profit organization, or taking a course that links public service with its curriculum.

ENGR 197-297 Cooperative Education/Internship **F&S SM** **1-3 credit hours each**
Repeatable up to a maximum of six semester hours. Work hours are arranged by employer, adviser and student. Progress is checked by oral and written reports from the employer. Periodic student adviser conferences are required to discuss progress or problems. Students are required to submit an accounting of their experiences to their instructor. All co-op experiences are based on a satisfactory/unsatisfactory basis. Department chair approval is required.

MECHANICAL ENGINEERING (ME)

ME 213 Modeling of Engineering Systems **Fall** **3 credits**
Introduction to engineering systems, modeling, and computations; computer methods; analytical methods; verification tasks; case studies. Prerequisite: Calculus 165.