

COLLEGE OF SCIENCE AND MATHEMATICS

www.ndsu.edu/scimath

Kevin D. McCaul, Dean

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Opportunities in the college reflect the belief that an understanding of the methods and findings of science is best achieved through first-hand experience in the process of conducting, analyzing, and reporting research. Students are encouraged to participate in this process by working closely with faculty and other students in laboratory and field research, thus gaining direct knowledge of the power, limits, and problems in scientific inquiry. These opportunities for direct experience with the tools of the scientist are liberally available to the interested and motivated student.

Departments of the College of Science and Mathematics include the following:

- Biological Sciences
- Chemistry and Molecular Biology
- Coatings and Polymeric Materials
- Computer Science
- Geosciences
- Mathematics
- Physics
- Psychology
- Statistics

Degree Programs

The College of Science and Mathematics provides undergraduate programs leading to a Bachelor of Science or Bachelor of Arts degree. Graduate programs at the master's and doctoral levels also are offered. For more complete details, see the Graduate Bulletin online at www.ndsu.edu/gradschool/bulletin.

Degree Requirements

All majors are required to complete departmental and general education requirements. Available majors include the following:

- Behavioral Statistics
- Biochemistry and Molecular Biology
- Biological Sciences
- Biotechnology
- Botany
- Chemistry
- Computer Science
- Geology
- Mathematics
- Natural Resources Management
- Physics
- Psychology
- Statistics
- Zoology

Minors are available in most departments.

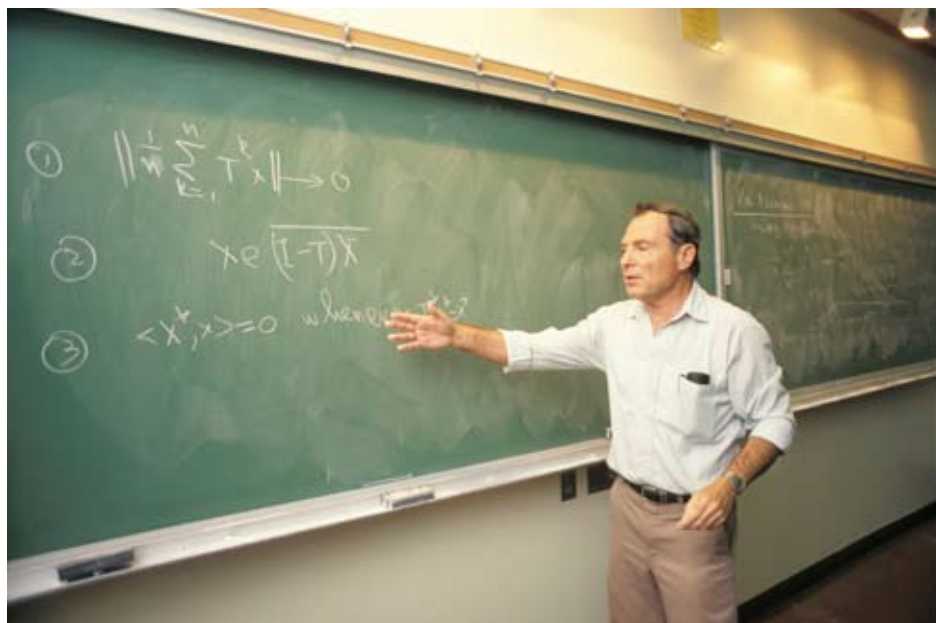
Courses to fulfill the major requirements in the college may not be taken pass/fail. Only elective courses outside the major may be taken pass/fail.

Course work transferring from another institution with a grade of D will count toward total number of credits, but not toward specific degree requirements.

Math 101 and 102 are developmental courses and will not count toward credits for graduation in any program.

General Education

College general education requirements for the two undergraduate degrees extend beyond the minimum university general education requirements. The college requires an additional six credits in humanities and/or social sciences for the Bachelor of Science degree and an additional 12 credits for



the Bachelor of Arts degree. This requirement may be fulfilled by any course having the following prefix: ADHM, ANTH, ARCH, ART, CDFS, CJ, CLAS, COMM, ECON, ENGL, FREN, GEOG, GERM, HIST, HUM, LA, LANG, MUSC, PHIL, POLS, PSYC, RELS, SOC, SPAN, THEA, WS, or any course from the approved list of general education courses in humanities and social sciences (general education categories A and B). These credits must come from outside the department of the student's major. An advisor should be consulted for specific courses. Students also are encouraged to follow their own interests in choosing electives that go beyond the minimum requirements. Basic requirements for each degree include the following:

Bachelor of Science Degree

	Credits
COMM 110, Fund of Public Speaking	.3
ENGL 110, 120, College Composition I, II	.6
ENGL Upper Level Writing Course ¹	.3
UNIV 189, Skills for Academic Success	.1
Humanities & Fine Arts ¹	.6
Humanities & Social Sciences (additional college requirement) ¹	.6
Quantitative Reasoning ¹	.3
Science & Technology ¹	.10
Social & Behavioral Sciences ¹	.6
Wellness ¹	.2
Cultural Diversity	--
Global Perspectives	--

¹ Refer to www.ndsu.edu/registrar for courses approved for General Education.

Bachelor of Arts Degree

B.A. degree requirements are the same as the B.S. degree with an additional six credits of humanities or social and behavioral sciences and the addition of two years of a modern foreign language. This means completion of the second year of college-level language or the equivalent. For example, students with two or three years of a foreign language in high school should enter second year college-level language. Students with four or more years of a foreign language in high school will be considered to have completed this requirement.

All degree candidates must apply for graduation through the Office of Registration and Records according to university procedures and deadlines.

Specializations

Specializations are provided for career preparation in a range of areas.

Pre-Professional Programs

Pre-professional curricula are offered by a number of departments for students interested in preparing for careers in medicine, dentistry, mortuary science, chiropractic, optometry, osteopathy, and other health related fields. Most pre-professional programs are flexible and can be developed around many different majors. Departments that have expressed a special interest in advising pre-professional majors include biological sciences, chemistry and molecular biology, physics and psychology.

In addition to the preceding, a number of departments have developed other specializations to meet today's rapidly changing job markets. These may be found in the individual department sections as follows:

Biological Sciences: environmental science, biotechnology, biological sciences education, comprehensive science education, wildlife and fisheries biology, and cell biology/physiology

Chemistry: biochemistry, biotechnology, chemistry education, pre-professional chemistry, coatings and polymeric materials

Geosciences: geochemistry

Psychology: natural science track, social sciences track, options in behavioral neuroscience, industrial-organizational, human services, and experimental

Teacher Certification

Several of the majors available through the College of Science and Mathematics lead to careers in teaching.

Students may complete the requirements for a major in the college, then apply for admission to the School of Education in the College of Human Development and Education to undertake the additional requirements necessary to qualify for teacher certification. Alternatively, students may initially select a science and mathematics education curriculum offered through the School of Education.

Programs leading to teacher certification are available in the following areas: biological sciences, chemistry, comprehensive science, earth science, mathematics, and physics.

Students interested in teacher education are encouraged to declare a double major in their discipline and in education (i.e., chemistry education and chemistry). Such double majors may typically be earned by successful completion of a few additional credits. Students should contact their advisors for details, and are encouraged to declare their primary and secondary majors with the Office of Registration and Records, 110 Ceres.

Pre-Medicine and Pre-Dentistry

The suggested program will meet the requirements of most medical and dental schools. In general, these requirements include organic chemistry, physics, and the equivalent of a year of general biology. Some college-level mathematics, such as MATH 146-147, is strongly recommended. The Bachelor of Arts degree program is recommended. Contact the Department of Biological Sciences for additional information (231-7087).

Pre-Medicine and Pre-Dentistry Requirements Credits

English & Speech Communication	9
Foreign Language	12
Humanities & Social Sciences	28*
Major	30*
Sciences & Mathematics	32
Skills for Academic Success	1
Wellness	2
Electives	10
Total	124

* Approximate number of credits in this subject area.

Interdisciplinary Programs

The College of Science and Mathematics participates in the following undergraduate interdisciplinary programs. For further information, refer to the Interdisciplinary Programs section of the Bulletin.

Biotechnology Major

www.ags.ndsu.nodak.edu/plantsci

Biotechnology is an interdisciplinary field based on a combination of biology and technology. It includes the application of science and technology to the design of new plants, animals, and microorganisms that have improved characteristics.

Natural Resources Management Major

www.ags.ndsu.nodak.edu/nrm

This interdisciplinary program is available through the College of Science and Mathematics' Biological Sciences and Geosciences departments and the College of Agriculture, Food Systems and Natural Resources' School of Natural Resources.

Cooperative Education

Cooperative Education, a program of the Career Center, offers undergraduate and graduate students an opportunity to integrate classroom study with paid, career-related work experience for academic credit. Work may be full or part time. Credit is granted through Continuing Education and awarded directly by the Cooperative

Education program. A Cooperative Education experience may substantially improve students' employment opportunities after graduation. Students may obtain one or two semesters of professional work experience related to their studies; however, no more than a total of three credits may be applied to the minimum of 122 credits required for the degree. Each department has specific requirements for earning these credits. The student must have approval from the department chair prior to beginning the Cooperative Education program.

Department of Biological Sciences

<http://biology.ndsu.nodak.edu>

The Department of Biological Sciences offers broad undergraduate preparation in the basic concepts and principles of the life sciences with major emphasis on both plant and animal forms. Various curricular options are available for specific career interests. It is important for students to consult frequently with their advisors regarding the proper options and courses related to their special interests. In addition, students should correspond early with professional or graduate schools to make sure they satisfy specific requirements.

Curricula for secondary school biological sciences education, comprehensive science education, environmental studies, traditional course sequences, and pre-professional programs are available in the department. Graduate work in biology is offered at the Master of Science level.

Students interested in majoring in a specific biological science (animal science, botany, entomology, horticulture, microbiology, plant pathology, or zoology) should consult the appropriate discipline.

Environmental Science Option

For students interested in careers that address solving environmental problems, there is the Biological Sciences major with an Environmental option. This rigorous option incorporates balanced studies in the natural sciences (biology, chemistry, physics, and earth sciences) with social sciences (economics, political science, and sociology). It also involves technology, business, law, ethics, and human relations and behavior. Students interested in this option should visit with an advisor to obtain the specific requirements.

Sample '08-09 Curriculum Biological Sciences Major

General Education Requirements	Credits
First Year Experience (F):	
UNIV 189, Skills for Academic Success	1
Communications (C):	
COMM 110, Fund of Public Speaking	3
ENGL 110 ¹ , 120, College Comp I, II	3,3
ENGL 324, Writing in the Sciences	3
Quantitative Reasoning (R):	
STAT 330, Intro Stats	3
Science & Technology (S):	
BIOL 150, 150L, Gen Biology I, Lab	3,1
BIOL 151, 151L, Gen Biology II, Lab	3,1
CHEM 121, 121L, Gen Chem I, Lab	3,1
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B)	6
Wellness (W)	2
Cultural Diversity (D) ²	--
Global Perspective (G) ²	--
Total	42

College/Department Requirements	Credits
HUM/SOC SCI Electives (B.S. Degree)	6
HUM/SOC SCI Electives (B.A. Degree)	12
Second Year Lang Proficiency (B.A. Degree)	--
Total	6-12

Major/Related Requirements	Credits
BIOL 364, General Ecology	3
BIOL 459, Evolution	3
BIOL 491, Seminar (Capstone)	2
BOT/ZOO 315, 315L, Genetics, Lab	3,1
BOT 372, Struct & Diversity of Plants & Fungi	4
CHEM 122, 122L, Gen Chem II, Lab	3,1
CHEM 240, Survey of Organic Chem & CHEM 260, Elements of Biochem or	3,4
CHEM 341, 341L, Organic Chem I, Lab or CHEM 342, Organic Chem II & BIOC 460, Found Biochem & Molec Bio I	4,3,4
MATH 146, Applied Calculus I	4
PHYS 211, 211L, College Physics I, Lab	3,1
PHYS 212, 212L, College Physics II, Lab	3,1
CSCI Elective ²	2
Total	41-45

Additional Requirements (General Biological Sciences Major Only)	Credits
ZOO 370, Cell Biology	3
Subdiscipline Electives ³	12
Earth Science Electives ³	7-8
Free Electives (for degree completion)	0-11
Total	22-34

Additional Requirements (Environmental Science Option Only)	Credits
GEOL 105, 105L, Physical Geology, Lab ⁴	3,1
GEOL 106, 106L, Earth Through Time, Lab	3,1
SOIL 217, Meteorology & Climatology	3
SOIL 410, Soil & the Environment	2
BOT/ ENT/MICR/ZOO Electives ²	13
CHEM 431, 431L, Analytical Chem I, Lab or GEOL 428, Geochemistry	3,2 or 3
MATH 147, Applied Calculus II	4
Physiology Elective ³	3
Structural Biology Elective ³	3-4
Total	39-42

Curriculum Total (min)

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.

2 May double count with select Humanities & Fine Arts, Social & Behavioral Science, and/or Science & Tech Gen Ed courses.

3 Refer to department or curriculum guide for course options.

4 Also counts as a Global Perspective (G) for general education.

Sample '08-09 Curriculum Biological Sciences Minor

Requirements	Credits
BIOL 150, 150L, Gen Biology I, Lab	3,1
BIOL 151, 151L, Gen Biology II, Lab	3,1
BOT 372, Struct & Diversity/Plants & Fungi	4
Electives ¹	6

Curriculum Total

1 Refer to department or curriculum guide for course options.

Biological Sciences Education and Comprehensive Science Education Majors

To meet requirements of the "No Child Left Behind" Act of 2001, students interested in Biological Sciences Education or Comprehensive Science Education are encouraged to declare a double major in the discipline and in education (i.e., Biological Sciences Education and Biological Sciences). Such double majors may typically be earned by successful completion of a few additional credits. Students should contact their advisors or the Office of Registration and Records for details, and are encouraged to declare their primary and

secondary majors with the Office of Registration and Records, Ceres 110.

Students who intend to teach biology in the secondary schools should make their intentions known to the School of Education and consult with a biology education advisor in the Department of Biological Sciences early in their programs to make certain that they have a well-designed program and take the professional education courses required for state teacher certification.

The Comprehensive Science Education major is designed to prepare the secondary general science teacher. This major is an especially good preparation for students who may find themselves teaching several different science courses. Information about curriculum and other requirements is available from the School of Education and the education advisor in the Department of Biological Sciences.

Sample '08-09 Curriculum Biological Sciences Education Major

General Education	Credits
First Year Experience (F):	
UNIV 189, Skills for Academic Success	1
Communications (C):	
COMM 110, Fund of Public Speaking	3
ENGL 110 ¹ , 120, College Comp I, II	3,3
ENGL 324, Writing in the Sciences	3
Quantitative Reasoning (R):	
MATH 146, Applied Calculus I	3
Science & Technology (S):	
BIOL 150, 150L, Gen Biology I, Lab	3,1
BIOL 151, 151L, Gen Biology II, Lab	3,1
CHEM 121, Gen Chem I	3
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B)	6
Wellness (W)	2
Cultural Diversity (D) ²	--
Global Perspective (G)	--
GEOL 105, Physical Geology	
Total	41

Major Requirements	Credits
BIOL 124, 124L, Environ Biology, Lab	3,1
BIOL 220, 220L Human Anat & Phys I, Lab	3,1
BIOL 221, 221L Human Anat & Phys II, Lab	3,1
BIOL 364, General Ecology	3
BIOL 459, Evolution	3
BIOL 491, Seminar (Capstone)	2
BOT/ZOO 315, 315L, Genetics, Lab	3,1
BOT 300-400 Elective	3
CHEM 121L, Gen Chem I Lab	1
CHEM 122, 122L, Gen Chem II, Lab	3,1
CHEM 240, Survey of Organic Chem	3
CHEM 260, Elements of Biochem	4
GEOL 105, 105L, Physical Geology, Lab	3,1
GEOL 106, 106L, Earth Through Time, Lab	3,1
PHYS 211, 211L, College Physics I, Lab	3,1
PHYS 212, 212L, College Physics II, Lab	3,1
STAT 330, Intro Stats	3
ZOO 370, Cell Biology	3
ZOO 300-400 Elective	3
CSCI Elective	3
Total	67

Professional Education Requirements	Credits
EDUC 321, Intro to Teaching	3
EDUC 322, Educational Psychology	3
EDUC 381, Early Experience	1
EDUC 451, Instruc, Planning, Meth & Assess	3
EDUC 481, Classrm Prac/Meth of Teach I-Sci	3
EDUC 485, Student Teach Seminar	1
EDUC 486, Classrm Mgt of Diverse Learners	2
EDUC 487, Student Teaching	9
EDUC 488, Applied Student Teaching	3

EDUC 489, Nat American/Multicult Inst Prac	3
Total	31

Curriculum Total 139

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.
 2 May double count with select Humanities & Fine Arts, Social & Behavioral Science, and/or Science & Tech, Gen Ed courses.

Sample '08-09 Curriculum Comprehensive Science Education Major

General Education Requirements	Credits
First Year Experience (F):	
UNIV 189, Skills for Academic Success	1
Communications (C):	
COMM 110 ¹ , Fund of Public Speaking	3
ENGL 110, 120, College Comp I, II	3,3
ENGL 324, Writing in the Sciences	3
Quantitative Reasoning (R):	
STAT 330, Intro Stats	3
Science & Technology (S):	
BIOL 150, 150L, Gen Biology I, Lab	3,1
BIOL 151, 151L, Gen Biology II, Lab	3,1
PHYS 110, Intro Astronomy	3
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B)	6
Wellness (W)	2
Cultural Diversity (D) ²	--
Global Perspective (G)	--
GEOL 105, Physical Geology	
Total	41

Major Requirements	Credits
BIOL 124, 124L, Environ. Biology, Lab	3,1
BIOL 491, Senior Seminar	2
BOT 372, Struct & Diversity of Plants & Fungi	4
CHEM 121, 121L, Gen Chem I, Lab	3,1
CHEM 122, 122L, Gen Chem II, Lab	3,1
CHEM 260, Elements of Biochem	4
CHEM 341, 341L, Organic Chem I, Lab	3,1
CHEM 342, 342L, Organic Chem II, Lab	3,1
CSCI Elective	2
MATH 165, Calculus I	4
MATH 166, Calculus II	4
PHYS 251, 251L, Univ Physics I, Lab	4,1
PHYS 252, 252L, Univ Physics II, Lab	4,1
GEOL 105, 105L, Physical Geology, Lab	3,1
GEOL 106, 106L, Earth Through Time, Lab	3,1
BIOL, BOT or ZOO 300-400 Electives ³	6
Total	64

Professional Education Requirements	Credits
EDUC 321, Intro to Teaching	3
EDUC 322, Educational Psychology	3
EDUC 381, Early Experience	1
EDUC 451, Instruc, Planning, Meth & Assess	3
EDUC 481, Classrm Prac/Meth of Teach I-Sci	3
EDUC 485, Student Teach Seminar	1
EDUC 486, Classrm Mgt of Diverse Learners	2
EDUC 487, Student Teaching	9
EDUC 488, Applied Student Teaching	3
EDUC 489, Nat American/Multicult Inst. Prac	3
Total	31

Curriculum Total 136

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.
 2 May double count with select Humanities & Fine Arts, Social & Behavioral Science, and/or Science & Tech, Gen Ed courses.
 3 Refer to department or curriculum guide for course options.

Botany Major

Departmental instruction is offered in the major area of botany for students in all colleges of the university, but botany courses and instructional procedures are specially designed for undergraduate and graduate students in the College of Science and Mathematics and the College of Agriculture, Food Systems, and Natural Resources. Completion of an undergraduate major prepares the students for graduate work or for professional employment. Graduate work in botany is offered at both the M.S. and Ph.D. levels. A minor in Botany is also available.

Sample '08-09 Curriculum Botany Major

General Education Requirements	Credits
First Year Experience (F):	
UNIV 189, Skills for Academic Success	1
Communications (C):	
COMM 110, Fund of Public Speaking	3
ENGL 110 ¹ , 120, College Comp I, II	3,3
ENGL 324, Writing in the Sciences	3
Quantitative Reasoning (R):	
STAT 330, Intro Stats	3
Science & Technology (S):	
BIOL 150, 150L, Gen Biology I, Lab	3,1
BIOL 151, 151L, Gen Biology II, Lab	3,1
CHEM 121, 121L, Gen Chem I, Lab	3,1
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B)	6
Wellness (W)	2
Cultural Diversity (D) ²	--
Global Perspective (G) ²	--
Total	42

College/Department Requirements	Credits
HUM/SOC SCI Electives (B.S. Degree)	6
HUM/SOC SCI Electives (B.A. Degree)	12
Second Year Lang Proficiency (B.A. Degree)	--
Total	6-12

Major Requirements	Credits
BOT 314, Systematic Botany	3
BOT 315, 315L, Genetics, Lab	3,1
BOT 372, Struct & Diversity of Plants & Fungi	4
BOT 380, Plant Physiology	3
BOT 460, Plant Ecology	3
BOT 471, Phycology or	
BOT 472, Lichenology	3
BOT 491, Seminar	2
Total	22

Related Requirements	Credits
BIOL 459, Evolution	3
MICR 350, 350L, Gen Microbiology, Lab	3,1
ZOO 370, Cell Biology	3
CHEM 122, 122L, Gen Chem II, Lab	3,1
CHEM Sequence ³	7-11
MATH 146, Applied Calculus I	4
CSCI Elective ³	2
PHYS 211, 211L, College Physics I, Lab	3,1
PHYS 212, 212L, College Physics II, Lab	3,1
Total	35

Additional Requirements	Credits
Free Electives (for degree completion)	11-17
Total	11-17

Curriculum Total (min) 122

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.
 2 May double count with select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech, Gen Ed courses.
 3 Refer to department or curriculum guide for course options.

Sample '08-09 Curriculum Botany Minor

Requirements	Credits
BIOL 150, 150L, Gen Biology I, Lab.....	3,1
BIOL 151, 151L, Gen Biology II, Lab.....	3,1
BOT 315, 315L, Genetics, Lab.....	3,1
BOT 372, Struct & Diversity/Plants & Fungi.....	4
Electives ¹	3

Curriculum Total 19

¹ Refer to department or curriculum guide for course options

Zoology Major

Minimum requirements for the Zoology major include 42 credits of biological sciences, of which 14 are "core" credits in zoology and biology. An additional 21 to 26 credits fulfill one of three options including courses in chemistry, physics, mathematics, and statistics. The 42 credits for the major are completed with elective zoology courses. College and university general education requirements constitute the remainder of the curriculum.

Zoology major "core" course requirements include the following:

- BIOL 150-150L, General Biology I, Lab
- BIOL 151, 151L, General Biology II, Lab
- ZOO 315-315L, Genetics, Lab
- ZOO 491, Seminar

Students may pursue their personal and career interests through one of the following options in zoology:

Option 1: General Zoology. This option includes more elective choices than the other options and is designed for students who wish to pursue an area not represented in the other two options.

Option 2: Physiology, Cell Biology, or Health Sciences. This option is designed for students who are interested in physiology or cell and molecular biology or who plan to enter professional schools (medical, dental, optometry, chiropractic) or graduate programs in physiology and cell biology. The emphasis is on additional course work in cell biology, physiology, chemistry, and physics.

Option 3: Fisheries, Wildlife, Ecology, and Behavior. This option is designed for students who are interested in fisheries management, ecology, conservation, natural resource management, or behavior. Courses that focus on invertebrates, fish, amphibians, reptiles, birds, mammals, ecology, management, animal behavior, and population dynamics are added to the "core" courses. In addition, a course in physiology and a course in morphology are required. These studies prepare the student for research or management positions with federal, state, or other agencies such as the U.S. Fish and Wildlife Service, State Game and Fish Departments, State Conservation Departments, U.S. and State Forest Services, U.S. Bureau of Land Management, Natural Resources Conservation Service, and the Environmental Protection Agency, as well as national and state parks.

A wildlife or fisheries biologist participates in a wide range of activities including natural history, systematics, aquatic and terrestrial ecology, population dynamics, management techniques, pollution biology, and public relations. Some positions require advanced training at the master's (M.S.) or doctoral (Ph.D.) level. In addition to the curriculum suggested, at least one summer or semester of field experience is recommended. Credits for field experience may be gained either at a biological field station or through employment approved by the advisor.

A grade-point average of 2.0 is required for courses taken to fulfill the 42 credits in the major. A maximum of two credits of Individual Study (494) and/or Field

Experience (496) and a maximum of two credits in Seminar (491) may apply to the 42 credits required for the major. All credits taken may apply toward those required for graduation. Graduate work in zoology is offered at both the M.S. and Ph.D. levels.

Sample curricula for the options in zoology are presented to illustrate a typical sequence in which zoology core courses and supporting courses in other areas may be planned. These sequences are meant only to be a guide; other models or pathways are certainly possible.

Sample '08-09 Curriculum Zoology Major

General Education Requirements	Credits
First Year Experience (F):	
UNIV 189, Skills for Academic Success.....	1
Communications (C):	
COMM 110, Fund of Public Speaking.....	3
ENGL 110 ¹ , 120, College Comp I, II.....	3,3
ENGL 324, Writing in the Sciences.....	3
Quantitative Reasoning (R):	
STAT 330, Intro Stats.....	3
Science & Technology (S):	
BIOL 150, 150L, Gen Biology I, Lab.....	3,1
BIOL 151, 151L, Gen Biology II, Lab.....	3,1
CHEM 121, 121L, Gen Chem I, Lab.....	3,1
Humanities & Fine Arts (A).....	6
Social & Behavioral Sciences (B).....	6
Wellness (W).....	2
Cultural Diversity (D) ²	--
Global Perspective (G) ²	--
Total	42

College/Department Requirements	Credits
HUM/SOC SCI Electives (B.S. Degree).....	6
HUM/SOC SCI Electives (B.A. Degree).....	12
Second Year Lang Proficiency (B.A. Degree).....	--
Total	6-12

Major/Related Requirements (All Options)	Credits
BIOL 150, 150L, Gen Biology I, Lab.....	3,1
BIOL 151, 151L, Gen Biology II, Lab.....	3,1
BOT 315, 315L, Genetics, Lab.....	3,1
ZOO 491, Capstone Seminar.....	2
CHEM 122, 122L, Gen Chem II, Lab.....	3,1
MATH 146, Applied Calculus I.....	4
Total	22

Option 1: General Zoology	Credits
Ecology/Behavior Electives ³	3-4
Physiology Elective ³	3
ZOO 450, Invertebrate Zoology.....	4
Biodiversity Elective ³	3
Morphology Elective ³	3-4
Cell Biology Elective ³	3-4
BOT 372, Struct & Diversity/Plants & Fungi.....	4
CHEM 341, 341L, Organic Chem I, Lab.....	3,1
PHYS 120, Fund of Physics.....	3
Zoology Electives ³	6-9
Option Total	30-33

Option 2: Physiology, Cell Biology & Health Science	Credits
Ecology/Behavior Electives ³	3-4
Physiology Elective ³	6
Biodiversity Elective ³	3-4
Morphology Elective ³	3-4
ZOO 370, Cell Biology.....	3
Cell Biology Elective ³	3-4
CHEM 341, 341L, Organic Chem I, Lab.....	3,1
CHEM 342, 342L, Organic Chem II, Lab.....	3,1
PHYS 211, 211L, College Physics I, Lab.....	3,1

PHYS 212, 212L, College Physics II, Lab.....	3,1
Zoology Electives ³	3-7
Option Total	37-41

Option 3: Fisheries, Wildlife, Ecology, Behavior	Credits
ZOO 364, General Ecology.....	3
Ecology/Behavior Electives ³	3-4
Physiology Elective ³	3
Biodiversity Elective ³	6-7
Morphology Elective ³	3-4
Management Electives ³	6
BOT 372, Struct & Diversity/Plants & Fungi.....	4
CHEM 240, Survey of Organic Chem.....	3
CSCI 114, Microcomputer Packages.....	3
PHYS 120, Fund of Physics.....	3
Zoology Electives ³	1-4
Option Total	37-41

Additional Requirements	Credits
Free Electives (for degree completion).....	7-24
Total	7-24

Curriculum Total (min) - All Options 122

¹ Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.

² May double count with select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech. Gen Ed courses.

³ Refer to department or curriculum guide for course options.

Sample '08-09 Curriculum Zoology Minor

Requirements	Credits
BIOL 150, 150L, Gen Biology I, Lab.....	3,1
BIOL 151, 151L, Gen Biology II, Lab.....	3,1
BOT 315, 315L, Genetics, Lab.....	3,1
Electives ¹	6

Curriculum Total 18

¹ Refer to department or curriculum guide for course options.

Department of Chemistry and Molecular Biology

www.ndsu.edu/chemistry

Chemistry, widely regarded as a central science, involves the study of matter and the transformation of matter at a molecular level. A very wide range of consumer products, including plastics, personal care products, pharmaceuticals, etc. owe their development at least partially to modern chemistry. Chemists work in industry, educational institutions, and government laboratories, developing new materials, new pharmaceutical, improved chemical analysis methods, etc.

Biochemistry and molecular biology involve the interdisciplinary study of the chemical and physical properties of living systems and the chemical changes that take place in living organisms. Careers in biochemistry and molecular biology require preparation in chemistry and biology, as well as biochemistry and molecular biology. This is a rapidly advancing field, with many recent developments in the unraveling of the genetic code, forensic science, bioinformatics, etc. This field plays a central role in advances in human health.

The department offers both B.S. and B.A. degrees in Chemistry, with several degree options, and in Biochemistry and Molecular Biology. Students beginning study in these programs must have a strong background in chemical science.

Graduate study is available in Chemistry (M.S. and Ph.D. degrees), and Biochemistry (M.S. and Ph.D. degrees). Students beginning study in these programs must have a strong background in chemical science. For the

Biochemistry graduate programs, prior training in the life sciences is desirable, but not essential. For more details, see the department website or the Graduate Bulletin Website at www.ndsu.edu/gradschool/bulletin.

Biochemistry and Molecular Biology Major

The Biochemistry and Molecular Biology major is designed to give students a detailed understanding of the chemistry of living matter. Careers exist in medical, pharmaceutical, food processing, and agricultural laboratories. Graduates also will have excellent preparation for graduate school or schools of medicine, dentistry, veterinary science, and business.

Sample '08-09 Curriculum

Biochemistry & Molecular Biology Major

General Education Requirements	Credits
First Year Experience (F):	
UNIV 189, Skills for Academic Success	1
Communications (C):	
COMM 110, Fund of Public Speaking	3
ENGL 110 ¹ , 120, College Comp I, II	3,3
ENGL 324, Writing in the Sciences	3
Quantitative Reasoning (R):	
MATH 165, Calculus I	4
Science & Technology (S):	
BIOL 150, 150L, General Biology I, Lab	3,1
BIOL 151, 151L, General Biology II, Lab	3,1
PHYS 251, 251L, Univ Physics I, Lab	4,1
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B)	6
Wellness (W)	2
Cultural Diversity (D) ²	--
Global Perspective (G) ²	--
Total	44

College/Department Requirements	Credits
HUM/SOC SCI Electives (B.S. Degree)	6
HUM/SOC SCI Electives (B.A. Degree)	12
Second Year Lang Proficiency (B.A. Degree)	--
Total	6-12

Major Requirements	Credits
BIOC 460, 461, Biochem/Molec Biol I, II	4,4
BIOC 465, Phys Chem and Biophysics	4
BIOC 473, Meth Biochem Research	3
BIOC 474, Recombinant DNA Techniques	3
BIOC 483, Cell Sig Trans Metabl.	3
BIOC 487, Molec Biol Gene Expression	3
CHEM 121, 121L, Gen Chem I, Lab or CHEM 150, 160, Prin of Chemistry I, Lab	3,1
CHEM 122, 122L, Gen Chem II, Lab or CHEM 160, 161, Prin of Chemistry II, Lab	3,1
CHEM 341, 341L, Organic Chem I, Lab	3,1
CHEM 342, 342L, Organic Chem II, Lab	3,1
CHEM 380, Chem Junior Seminar	1
CHEM 431, 431L, Analyt Chemistry I, Lab	3,2
CHEM 491, Chemistry Senior Seminar	2
MATH 166, Calculus II	4
MICR 350, 350L, Gen Microbiology, Lab	3,1
PHYS 252, 252L, Univ Physics II, Lab	4,1
ZOO 315, Genetics	3
Science 300-400 Level Electives ³	3
Total	73

Curriculum Total (min) 122

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.

2 May double count with Select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech Gen Ed Courses.

3 Refer to department or curriculum guide for course options.

Biochemistry Minor

A minor in Biochemistry also is available. Contact the department for details.

Chemistry Major

The ACS certified Chemistry major is the basic chemistry degree designed for students seeking careers in the chemical industry, or careers in law, government, journalism, business, etc., that would benefit from a strong background in the physical sciences and mathematics. Many B.S. graduates go on to M.S. or Ph.D. studies. Other degree options include a biochemistry option (also ACS certified), a polymers option (also ACS certified), a pre-professional option, and a chemistry education option.

Students may apply for scholarships available from the Department of Chemistry and Molecular Biology and the Department of Coatings and Polymeric Materials. See www.ndsu.edu/bisonconnection/sfs/scholarships.

Pre-Professional Chemistry Option

This option is designed for students interested in medical, dental, optometry, or veterinary professional school, but who wish to have an alternative career path to careers in industry, law, government, journalism, business, etc., that would benefit from a strong background in the physical sciences and mathematics. This option also provides excellent preparation for graduate study in biochemistry, biotechnology, and molecular biology.

Polymers Option (ACS Certified)

This program is for students who wish to prepare for a career as a chemist in coatings and polymers industries, or for graduate school in polymer chemistry. This is the only program in the U.S. that combines an ACS-certified B.S. degree in Chemistry with a coatings and polymeric materials curriculum. Students have numerous opportunities to participate in the summer research and cooperative programs sponsored by the industry.

Scholarship support from the Department of Coatings and Polymeric materials is available to students who elect this option.

Chemistry Education Option

This option is designed for the student interested in a disciplinary major in chemistry, but who is also considering becoming a chemistry and physics teacher. The curriculum includes physics coursework beyond the usual chemistry major to enable the graduate to teach physics in most states.

For teacher certification, students must apply to the School of Education to enroll in the additional requirements, which include EDUC 389, 451, 481, 486, and 487, taken post-baccalaureate. ACS certification may be earned by taking CHEM 471, 429, and 432/432L, as additional courses and choosing BIOC 460 instead of CHEM 260.

Scholarships starting in the sophomore year are available for students in the Chemical Education option.

Sample '08-09 Curriculum

Chemistry Major

General Education Requirements	Credits
First Year Experience (F):	
UNIV 189, Skills for Academic Success	1
Communications (C):	
COMM 110, Fund of Public Speaking	3
ENGL 110 ¹ , 120, College Comp I, II	3,3
ENGL 321, Writing in Technical Profess or ENGL 324, Writing in the Sciences	3
Quantitative Reasoning (R):	
MATH 165, Calculus I	4
Science & Technology (S):	
CHEM 121, 121L, Gen Chem I, Lab or CHEM 150, 160, Prin of Chem I, Lab	3,1
CHEM 122, 122L, Gen Chem II, Lab or CHEM 160, 161, Prin of Chem II, Lab	3,1

PHYS 251, 251L, Univ Physics I, Lab	4,1
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B)	6
Wellness (W)	2
Cultural Diversity (D) ²	--
Global Perspective (G) ²	--
Total	44

College/Department Requirements	Credits
HUM/SOC SCI Electives (B.S. Degree)	6
HUM/SOC SCI Electives (B.A. Degree)	12
Second Year Lang Proficiency (B.A. Degree)	--
Total	6-12

Major/Related Requirements (All Options) Credits

CHEM 341, 342, Organic Chemistry I, II	3,3
CHEM 353, 354, Maj Org Chem Labs I, II	1,2
CHEM 364, 365, Physical Chemistry I, II	4,4
CHEM 380, Chem Junior Seminar	1
CHEM 431, 431L, Analyt Chemistry I, Lab	3,2
CHEM 491, Chemistry Senior Seminar	2
BIOC 460, Found of Biochem & Molec Bio I	4
MATH 166, Calculus II	4
MATH 128, Intro Linear Algebra	1
MATH 259, Multivariate Calculus	3
MATH 266, Intro Diff Equations	3
PHYS 252, 252L, Univ Physics II, Lab	4,1
Total	45

Option 1: ACS Chemistry Credits

CHEM 471, Physical Chemistry Lab	2
CHEM 425, 429, Inorganic Chemistry, Lab	3,2
CHEM 432, 432L, Analyt Chemistry II, Lab	3,1
Option Total	10

Option 2: Biochemistry (ACS Certified) Credits

CHEM 425, 429, Inorganic Chemistry, Lab	3,2
CHEM 471, Physical Chemistry Lab	2
BIOC 461, Found. of Biochem & Molec Bio II	4
BIOC 473, Meth Biochem Research	3
BIOC 474, Meth/Recombinant DNA Tech	3
MICR 350, 350L, Gen Microbiology, Lab	3,1
BIOL 150, 150L, General Biology I, Lab	3,1
BIOL 151, 151L, General Biology II, Lab	3,1
Biological Sci. Electives ³	6
Option Total	36

Option 3: Coatings and Polymeric Materials Credits

CPM 473, Polymers Synthesis	3
CPM 474, 484, Coatings I, Lab	3,2
CPM 475, 485, Coatings II, Lab	3,2
CHEM 425, 429, Inorganic Chemistry, Lab	3,2
CHEM 471, Physical Chemistry Lab	2
CHEM 432, 432L, Analyt Chemistry II, Lab	3,1
Option Total	24

Option 4: Pre-Professional Chemistry Credits

CHEM 425, Inorganic Chemistry	3
MICR 350, 350L, Microbiology I & Lab	3,1
BIOL 150, 150L, General Biology I, Lab	3,1
BIOL 151, 151L, General Biology II, Lab	3,1
BIOL 220, 220L, Human Anat/Phys I, Lab	3,1
BIOL 221, 221L, Human Anat/Phys II, Lab	3,1
Option Total	23

Option 5: Chemical Education Credits

CHEM 425, Inorganic Chemistry	3
EDUC 321, Intro to Teaching	3
EDUC 322, Educational Psych	3
EDUC 381, Early Experience	1
BIOL 150, 150L, General Biology I, Lab	3,1
Physics Elective ³	3

Recommended Courses:	Credits
BIOL 151, 151L, General Biology II, Lab	3,1
GEOL 105, 105L, Physical Geology, Lab	3,1
<i>Option Total</i>	<i>17-25</i>

Curriculum Total (min) - All Options 122

- 1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.
- 2 May double count with select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech Gen Ed courses.
- 3 Refer to department or curriculum guide for course options.

Note: A course in earth sciences and in biology may be required for certification in some states. GEOL 105/105L and BIOL 151/151L are recommended electives.

Sample '08-09 Curriculum Chemistry Minor

Required Courses	Credits
CHEM 121, 121L, Gen Chem I, Lab	3,1
CHEM 122, 122L, Gen Chem II, Lab.	3,1
CHEM/BIOC/CPM 300-400 Level Electives	11

Curriculum Total 19

Department of Coatings and Polymeric Materials

<http://cpm.ndsu.nodak.edu>

The Department of Coatings and Polymeric Materials is internationally known for the excellence of its educational and research programs. Close ties with industry and government agencies are maintained to assure that teaching and research programs remain in step with the rapidly changing science and technology of the area.

Knowledge of polymers is a desirable foundation for a career as a professional chemist in industry. More than 80 percent of industrial chemists work with polymers, and many physicists and engineers also work with polymer-related materials.

Within the broad area of polymers, the department puts special emphasis on coatings. Coatings are so often encountered in everyday life that they may be taken for granted. Paint on walls, coatings on automobiles or aircraft, liners for the interior of beverage cans, coatings to protect bridges from corrosion, coatings on magnetic tapes and computer chips, and body implants are only a few selected examples.

Closely related fields are adhesives, printing inks, plastics, cosmetics, food, and biotechnology. Only five other universities in the U.S. offer programs in coatings and employment opportunities far exceed the number of graduates.

To encourage students to study in the field, companies and organizations fund undergraduate scholarships of up to \$2,500 a year. Entering freshmen and transfer students apply for these scholarships through the Office of Admission. Undergraduates already enrolled at NDSU apply to the department chair.

While a minor is available, the Department of Coatings and Polymeric Materials does not offer an undergraduate major. Undergraduates interested in polymers and coatings are encouraged to major in Chemistry or Mechanical Engineering (ME). Coatings and Polymeric Materials offers graduate level programs leading to the M.S. and Ph.D. degrees in Coatings and Polymeric Materials.

The Coatings and Polymeric Materials minor provides excellent preparation for professional employment at the B.S. level and for graduate school. Students are strongly advised to plan their programs so that the entire coatings course (CPM 474, 475) and laboratory sequence (CPM 484, 485 for Chemistry majors) (CPM 484 for ME majors) can be taken during the same academic year.

Chemistry majors with the CPM minor also are required to take polymer synthesis (CPM 473) prior to graduation.

Sample '08-09 Curriculum Coatings & Polymeric Materials Minor

Choose 16 credits from the following:	Credits
CHEM 341, 341L, Organic Chem I, Lab ¹	3,1
CHEM 342, 342L, Organic Chem II, Lab ¹	3,1
CPM 472, Environment & Chemical Indust	2
CPM 473, Polymers Synthesis	3
CPM 474, Coatings I	3
CPM 475, Coatings II	3
CPM 484, Coatings I Lab	2
CPM 485, Coatings II	2
CPM 486, Corrosion & Control by Coatings	2
CPM 497, Individual Study.	1-3
CPM 451, Lab Safety	1

Curriculum Total 16

¹ Credits do not count toward minor if also required for major.

Department of Computer Science
www.cs.ndsu.nodak.edu

Computer Science Major

The Department of Computer Science at NDSU offers degrees or certification in the following undergraduate and graduate areas: Bachelor of Arts: Computer Science; Bachelor of Science: Computer Science or double major in Computer Science and Mathematics; Master of Science: Computer Science or Software Engineering; Ph.D.: Computer Science or Software Engineering; Graduate Certificate: Digital Enterprise (e-commerce) or Software Engineering.

The B.S. program is accredited by the Computing Accreditation Commission of ABET. A minor in computer science is also offered. Advisors will provide students with personal attention in formulating programs with personal attention tailored to the interests and abilities of the individual student. For students with no computer experience, introductory courses are offered in the standard curriculum for majors. It is possible for advanced undergraduate students to take graduate courses while completing the undergraduate program.

Graduates in computer science might choose a job in technology development, business, agriculture, industry, education, research, or government. Their work might be in any of these areas: systems analysis, security, information assurance, bioinformatics, Web development, networking, information system development, data base management, software systems, computer operating systems, systems for process control, automation systems, simulation models, design and development of new computer systems, or management.

Graduates of the computer science program have recently accepted employment in major national businesses and industries. Many have chosen positions in North Dakota and adjoining states. With the wide use of computers and the Internet there is a growing need for computer specialists within North Dakota. Graduates are typically offered attractive starting salaries. Placement rates are high, and job prospects are projected to grow dramatically in upcoming years.

To be prepared to enter the Computer Science program, a student should have the usual college preparatory courses including at least three years of mathematics. Courses that develop the ability to think logically, to organize, and to analyze are especially important and require a background in mathematics (e.g., algebra, geometry, trigonometry).

Students who have taken college-level courses or who have computer experience can have their work evaluated for possible departmental advanced placement.

The computer science undergraduate programs, based on recommendations of the Association for Computing Machinery, consist of a core of courses required for majors and a large selection of service courses and advanced courses. In the core, students are offered an opportunity to study concepts, applications, and implementation techniques that provide a broad and practical base for both further study and a career in computing. Through a variety of service courses, every student in the university is provided an opportunity to develop computer literacy or competency. Through advanced undergraduate and graduate courses, students are offered an opportunity for in-depth study of such topics as artificial intelligence, programming languages, system simulation, computer networks, security, information assurance, office automation, bioinformatics, software development, combinatorial optimization, systems programming, data mining, and data base management systems. Students are encouraged to choose elective courses from related areas including business, economics, engineering, mathematics, operations research, and statistics.

After completing part of their studies, students will find many opportunities to work part time as a research assistant to a scientist on campus, or as an intern with a local business, applying what they have learned in the classroom. Cooperative education opportunities starting in the junior year are available.

Sample '08-09 Curriculum Computer Science Major - B.A. & B.S. Degrees

General Education Requirements	Credits
First Year Experience (F):	
UNIV 189, Skills for Academic Success	1
Communications (C):	
COMM 110, Fund of Public Speaking.	3
ENGL 110 ¹ , 120, College Comp I, II	3,3
ENGL 321, Writing in Technical Profess or	
ENGL 324, Writing in the Sciences.	3
Quantitative Reasoning (R):	
MATH 146, Applied Calculus I (B.A.) or	
MATH 165, Calculus I (B.S.)	4
Science & Technology (S)	10
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B)	6
Wellness (W)	2
Cultural Diversity (D) ²	--
Global Perspective (G) ²	--
Total	41

College/Department Requirements	Credits
HUM/SOC SCI Electives (B.S. Degree)	9
HUM/SOC SCI Electives (B.A. Degree)	12
Second Year Lang Proficiency (B.A. Degree)	--
Total	9-12

Major/Related Requirements	Credits
CSCI 160, 161, Computer Science I, II.	4,4
CSCI 335, Theoretical Computer Science I	3
CSCI 366, Files for Database Systems	3
CSCI 372, Comparative Languages	3
CSCI 373, Assembly Programming.	3
CSCI 374, Comp. Org. & Architecture.	3
CSCI 445, Software Projects: Capstone.	3
CSCI 474, Operating Systems Concepts	3
CSCI 489, Social Implications of Computers	3
STAT 367, Probability	3
Total	35

Additional Requirements (B.A. Only)	Credits
CSCI 114, Microcomputer Packages ³	3
CSCI 159, Computer Sci Problem Solving.	3
CSCI 315, Systems Analysis & Design.	3
CSCI 316, System Testing & Maintenance	3
CSCI 418, Simulation Models	3

CSCI Electives⁴6
 MATH 147, Applied Calculus II4
 Sci/Operat Rsch/Engr/Math/Stat Electives⁴16
Total 41

Additional Requirements (B.S. Only) Credits
 CSCI 336, Theoretical Computer Science II3
 CSCI 467, Algorithm Analysis3
 CSCI 475, Operating Systems Design or
 CSCI 468, Database System Design3
 CSCI Electives⁴9
 MATH 166, Calculus II4
 STAT 368, Statistics3
 CSCI 222, Discrete Mathematics3
 One Year of Lab Science8
 Additional Science Electives⁴6
Total 42

Curriculum Total (min) - B.A. or B.S. 122

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.
 2 May double count with select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech Gen Ed courses.
 3 Also counts toward the Sci/Technology Gen Ed Requirement. See the document "Requirements for a Bachelor's Degree in Computer Science at NDSU" for distribution.
 4 Requirements that must be satisfied in choosing electives. This document is available from the department office, 258 IACC, or on the Web (www.cs.ndsu.nodak.edu). Refer to department or curriculum guide for course options.

Computer Science Minor

A minor in Computer Science requires at least 18 semester hours of select computer science courses. A grade of C or better is required in all courses applied toward the computer science minor.

Sample '08-09 Curriculum Computer Science Minor

Requirements Credits
 CSCI 160, 161, Computer Science I, II or
 CSCI 227, 228, Computing Fund I, II 8 or 6
 CSCI 300-400 Level Electives⁴6
 Additional CSCI Electives¹4-6
Curriculum Total 18

1 Refer to department or curriculum guide for course options.

Department of Geosciences
www.ndsu.edu/geosci

Geology and Geography are the sciences of the Earth, its environments, peoples, and cultures.

Geology Major

Geology is one of the most exciting and rewarding areas of study. Understanding Earth's environment is accomplished through an interdisciplinary curriculum where knowledge of physics, chemistry, mathematics, biology, engineering and soil science come together to offer a better understanding of our Earth.

Opportunities for a career in geology have never been better. Areas of environmental science, petroleum, mining, water and land resources, volcanology, paleontology, and glacial geology offer rewarding careers with a completed bachelor's degree. Many students continue study at the graduate level.

Curriculum requirements include a departmental core of 47 credits, including year-long sequences in calculus, chemistry, and physics, as well as skills courses in technical writing and computer science.

A typical first year for all geology majors includes physical geology, the Earth through time, and year-long sequences in English, mathematics, and chemistry.

Sample '08-09 Curriculum Geology Major

General Education Requirements Credits
 First Year Experience (F):
 UNIV 189, Skills for Academic Success1
 Communications (C):
 COMM 110, Fund of Public Speaking3
 ENGL 110¹, 120, College Comp I, II 3,3
 ENGL 324, Writing in the Sciences3
 Quantitative Reasoning (R):
 MATH 146, Applied Calculus I or
 MATH 165, Calculus I4
 Science & Technology (S):
 GEOL 105, 105L, Physical Geology, Lab 3,1
 GEOL 106, 106L, Earth Through Time Lab 3,1
 CHEM 121, Gen Chem I or
 CHEM 150, Prin of Chem I3
 Humanities & Fine Arts (A)6
 Social & Behavioral Sciences (B)6
 Wellness (W)2
 Cultural Diversity (D)² --
 Global Perspective (G)² --
 GEOL 105, Physical Geology --
Total 42

College/Department Requirements Credits
 HUM/SOC SCI Electives (B.S. Degree)6
 HUM/SOC SCI Electives (B.A. Degree)12
 Second Year Lang Proficiency (B.A. Degree) --
Total 6-12

Major Requirements Credits

GEOG 455, Intro to Geographic Info Syst3
 GEOL 105, 105L, Physical Geology, Lab 3,1
 GEOL 106, 106L, Earth Through Time Lab 3,1
 GEOL 410, Sedimentology/Stratigraphy4
 GEOL 412, Geomorphology3
 GEOL 420, 421, Mineralogy, Lab 4,2
 GEOL 422, Petrology4
 GEOL 423, Petrography2
 GEOL 440, Quaternary Biology4
 GEOL 450, Field Geology3
 GEOL 457, Structural Geology4
 GEOL 491, Seminar (Junior Year)1
 GEOL 491, Capstone (Senior Year)1
 SOIL 444, Soil Genesis & Survey4
Total 47

Related Requirements Credits

CHEM 121, 121L, Gen Chem I, Lab &
 CHEM 122, 122L, Gen Chem II, Lab or
 CHEM 150, 151, Prin. Chem I, Lab &
 CHEM 160, 161, Prin. Chem II, Lab 3,1 & 3,1
 MATH 146, 147, Applied Calculus I, II or
 MATH 165, 166, Calculus I, II4,4
 PHYS 211, 211L, College Phys I, Lab &
 PHYS 212, 212L, College Phys II, Lab or
 PHYS 251, 251L, Univ. Phys I, Lab
 PHYS 252, 252L, Univ. Phys II, Lab 4,4
 CSCI 122, Beginning Basic/Visual Basic or
 CSCI 160, Computer Science I or
 CSCI 227, Computing Fundamentals3
Total 27

Curriculum Total (min) 122

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.
 2 May double count with select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech Gen Ed courses.

Note: Majors planning on graduate studies should be aware that a summer field camp course may be required for graduate admission. This course is recommended to be taken during the summer following the junior or senior year. Information on field camp courses and a small departmental scholarship to support these studies may be obtained from an advisor.

Geology Minor

A minor in geology consists of at least 18 credits of geology courses selected in consultation with a minor advisor. Selected geography and soil science courses may be substituted for geology courses.

Sample '08-09 Curriculum Geology Minor

Requirements Credits
 GEOL Electives¹18

Curriculum Total 18

1 Refer to department or curriculum guide for course options

Sample '08-09 Curriculum Environmental Geology Minor

Requirements Credits
 GEOL 105, 105L, Physical Geology, Lab 3,1
 GEOL 300, Environmental Geology3
 GEOL 412, Geomorphology3
 GEOL 414, Hydrogeology3
 GEOL 428, Geochemistry3
 GEOL 413, Glacial Geology or
 GEOL 440, Quaternary Biology3 or 4

Curriculum Total 19

Teaching Option: Curriculum emphasis is on the teaching of Earth science. Students preparing for teaching Earth science in the secondary schools must follow the School of Education curriculum.

Students interested in Earth Science Education are encouraged to declare a double major in their discipline and in education (i.e., Earth Science and Geology). Such double majors may typically be earned by successful completion of a few additional credits. Students should contact their advisors or the Office of Registration and Records for details, and are encouraged to declare their primary and secondary majors with the Office of Registration and Records, 110 Ceres.

Sample '08-09 Curriculum Earth Science Education Major

General Education Requirements Credits
 First Year Experience (F):
 UNIV 189, Skills for Academic Success1
 Communications (C):
 COMM 110, Fund of Public Speaking3
 ENGL 110¹, 120, College Comp I, II 3,3
 ENGL 324, Writing in the Sciences3
 Quantitative Reasoning (R):
 MATH 165, Calculus I4
 Science & Technology (S):
 BIOL 150, 150L, Gen Biology I, Lab 3,1
 SOIL 217, Intro to Meteorology3
 PHYS 110, Intro Astronomy3
 Humanities & Fine Arts (A)6
 Social & Behavioral Sciences (B)6
 Wellness (W)2
 Cultural Diversity (D)² --
 Global Perspective (G) --
 GEOL 105, Physical Geology --
Total 41

College/Department Requirements	Credits
GEOL 105, 105L, Physical Geology, Lab	3,1
GEOL 106, 106L, Earth Through Time Lab	3,1
STAT 330, Intro Stats	3
Total	11

Major Requirements	Credits
BIOL 124, 124L, Environ Biology, Lab	3,1
BIOL 151, 151L, Gen Biology II, Lab	3,1
BIOL Elective ³	3
CHEM 121, 121L, Gen Chem I, Lab	3,1
CHEM 122, 122L, Gen Chem II, Lab	3,1
CHEM Elective	4
CSCI 122, Visual Basic	3
GEOL 350, Invertebrate Paleontology or GEOL 440, Quaternary Biology	3
GEOG 412, Geomorphology	3
GEOL 420, 421, Mineralogy, Lab	4,2
GEOL 422, 423, Petrology/Petrography	4,2
GEOL 491, Seminar	1
GEOL Electives	6
PHYS 211, 211L, College Physics I, Lab	3,1
PHYS 212, 212L, College Physics II, Lab	3,1
Total	59

Professional Education Requirements	Credits
EDUC 321, Intro to Teaching	3
EDUC 322, Educational Psychology	3
EDUC 381, Early Experience	1
EDUC 451, Instruc, Planning, Meth & Assess	3
EDUC 481, Classrm Prac/Meth of Teach I-Sci	3
EDUC 485, Student Teach Seminar	1
EDUC 486, Classrm Mgt of Diverse Learners	2
EDUC 487, Student Teaching	9
EDUC 488, Applied Student Teaching	3
EDUC 489, Nat American/Multicult Inst Prac	3
Total	31

Curriculum Total 142

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.

2 May double count with select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech Gen Ed courses.

3 Refer to department or curriculum guide for options.

Geography Minor

Emphases in the geography program are: (a) gaining an understanding of the geographic perspective, and (b) acquiring skills in the use of spatial analysis tools (such as geographic information systems (GIS), computer mapping, and other computer applications).

Geography offers a minor that may be taken in conjunction with a variety of majors such as social science and secondary education. Minor requirements are 18 credits selected in consultation with the geography advisor. Students preparing for teaching geography in the secondary schools should follow the School of Education curriculum.

Sample '08-09 Curriculum Geography Minor

Requirements	Credits
GEOG Electives ¹	18

Curriculum Total 18

1 Refer to department or curriculum guide for course options.

Department of Mathematics

www.ndsu.edu/math

Mathematics Major

Mathematics is the language of science and technology. Its explosive development in the 20th century and its history as the oldest and most highly developed discipline make it one of the most exciting and rewarding areas of study.

The use of mathematics and the need for mathematical competence has increased tremendously. Mathematical training is in high demand in such fields as actuarial science, business, economics and commerce, engineering, and statistics, as well as the basic sciences. These disciplines, in turn, feed back new directions to the mathematical community. Trends indicate that students should plan their programs to reflect the increased emphasis on interdisciplinary competency.

Students are able to study theoretical and applied mathematics to prepare for careers or for further schooling while studying with faculty members who have a wide range of interests and expertise. Students may earn academic credit by applying what they have learned in the classroom as they gain on-the-job experience through the Cooperative Education program. Opportunities also exist for students to work as paper graders and assistants to professors.

The department offers a broad and balanced curriculum of courses. A student may major or minor in Mathematics or Mathematics Education.

Students interested in Mathematics Education should consult with their major advisor and the School of Education for professional education requirements. To meet requirements of the "No Child Left Behind" Act 2001, students interested in Mathematics Education are encouraged to declare a double major in their discipline and in education (i.e., mathematics education and mathematics). Such double majors may typically be earned by successful completion of a few additional credits. Students should contact their advisors or the Office of Registration and Records for details, and are encouraged to declare their primary and secondary majors with the Office of Registration and Records, Ceres 110.

Special double majors are available with computer science, physics, and statistics. These double majors take advantage of the close relationship between mathematics and other disciplines, and allow students pursuing a major in one of these fields to expand their mathematical background.

While the choice of major need not be made during the freshman year, an early decision allows more flexibility in tailoring programs to individual interests. The department also has a graduate program offering both an M.S. and a Ph.D. in Mathematics.

Pre-Actuarial Science Option

Actuarial science is the study of the evaluation and measurement of risk. The Actuary Science option is a pre-professional program designed to provide the background needed to enter the field. Entrance into the profession is regulated under a system of examinations run by actuarial professional societies. The curriculum of the option is designed to prepare the student to pass several of these examinations. The nature of the actuarial profession requires its practitioners to have a broad knowledge of finance, law, mathematics, management, and statistics. This option leads to a double major in mathematics and statistics with either a minor in economics or additional courses in business. Students selecting this option are requested to visit with the actuarial advisor in the Department of Mathematics early and often to confirm their progress and to inform themselves of changes in the examination curriculum.

Sample '08-09 Curriculum Mathematics Major

General Education Requirements	Credits
First Year Experience (F):	
UNIV 189, Skills for Academic Success	1
Communications (C):	
COMM 110, Fund of Public Speaking	3
ENGL 110 ¹ , 120, College Comp I, II	3,3
ENGL Upper Level Writing Course ²	3
Quantitative Reasoning (R):	
MATH 165, Calculus I	4
Science & Technology (S)	10
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B)	6
Wellness (W)	2
Cultural Diversity (D) ³	--
Global Perspective (G) ³	--
Total	41

College/Department Requirements	Credits
HUM/SOC SCI Electives (B.S. Degree)	6
HUM/SOC SCI Electives (B.A. Degree)	12
Second Year Lang Proficiency (B.A. Degree)	--
Total	6-12

Major Requirements	Credits
MATH 165, Calculus I	4
MATH 166, Calculus II	4
MATH 265, Calculus III	4
MATH 266, Intro Diff Equations	3
MATH 270, Intro to Abstract Math	3
MATH 420, Abstract Algebra I	3
MATH 429, Linear Algebra	3
MATH 450, Real Analysis I	3
MATH 421, Abstract Math or MATH 451, Real Analysis II	3
MATH 491, Capstone Seminar	1
MATH Electives ²	10
Total	41

Additional Requirements	Credits
CSCI 160, Computer Science I	4
Lab Science Sequence ²	8-10
CSCI Electives ²	6
Free Electives (for degree completion)	14-22
Total	32-42

Curriculum Total (min) 122

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.

2 Refer to department or curriculum guide for course options.

3 May double count with Select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech Gen Ed Courses.

Sample '08-09 Curriculum Math & Computer Science Double Major

General Education Requirements	Credits
First Year Experience (F):	
UNIV 189, Skills for Academic Success	1
Communications (C):	
COMM 110, Fund of Public Speaking	3
ENGL 110 ¹ , 120, College Comp I, II	3,3
ENGL Upper Level Writing ²	3
Quantitative Reasoning (R):	
MATH 165, Calculus I	4
Science & Technology (S)	10
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B)	6
Wellness (W)	2
Cultural Diversity (D) ³	--
Global Perspective (G) ³	--
Total	41

College/Department Requirements	Credits
HUM/SOC SCI Electives (B.S. Degree)	6
HUM/SOC SCI Electives (B.A. Degree)	12
Second Year Lang Proficiency (B.A. Degree)	--
Total	6-12

Major Requirements	Credits
MATH 166, Calculus II	4
MATH 265, Calculus III	4
MATH 266, Intro Diff Equations	3
MATH 429, Linear Algebra	3
MATH 430, Graph Theory	3
MATH 420, 421, Abstract Algebra I, II or MATH 450, 451, Real Analysis I, II	3,3
MATH 491, Capstone Seminar	1
CSCI 160, 161, Computer Science I, II	4,4
CSCI 335, 336, Theoretical Comp Sci I, II	3,3
CSCI 366, Files for Database Systems	3
CSCI 372, Comparative Languages	3
CSCI 373, Assembly Programming	3
CSCI 374, Comp Org & Architecture	3
CSCI 458, Microcomputer Graphics	3
CSCI 467, Algorithm Analysis	3
CSCI 474, Operating Systems Concepts	3
CSCI 489, Social Implications of Computers	3
Total	62

Related Requirements	Credits
STAT 367, Probability	3
STAT 368, Statistics	3
CSCI 222, Discrete Math or MATH 270, Intro to Abstract Math	3
CSCI 453, Linear programming or CSCI 460, Dynamic Programming or MATH 436, Combinatorics or MATH 488, Numerical Analysis I	3
Lab Science Sequence ²	8-10
Total	20-22

Curriculum Total (min) 122

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.

2 Refer to department or curriculum guide for course options.

3 May double count with select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech Gen Ed courses.

Sample '08-09 Curriculum Mathematics & Physics Double Major

General Education Requirements	Credits
First Year Experience (F): UNIV 189, Skills for Academic Success	1
Communications (C): COMM 110, Fund of Public Speaking ENGL 110 ¹ , 120, College Comp I, II ENGL Upper Level Writing Course ²	3 3,3 3
Quantitative Reasoning (R): MATH 165, Calculus I	4
Science & Technology (S): PHYS 251, 251L, Univ Physics I, Lab PHYS 252, 252L, Univ Physics II, Lab	4,1 4,1
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B)	6
Wellness (W)	2
Cultural Diversity (D) ³	--
Global Perspective (G) ³	--
Total	41

College/Department Requirements	Credits
HUM/SOC SCI Electives (B.S. Degree)	6
HUM/SOC SCI Electives (B.A. Degree)	12
Second Year Lang Proficiency (B.A. Degree)	--
Total	6-12

Major Requirements	Credits
MATH 166, Calculus II	4
MATH 265, Calculus III	4
MATH 266, Intro to Differential Equations	3
MATH 270, Intro to Abstract Math	3
MATH 420, Abstract Algebra I	3
MATH 429, Linear Algebra	3
MATH 450, Real Analysis I	3
MATH 421, Abstract Algebra II or MATH 451, Real Analysis II	3
MATH 491, Capstone Seminar	1
MATH/STAT Electives ²	4
PHYS 251R, Univ Physics I, Recitation	1
PHYS 252R, Univ Physics II, Recitation	1
PHYS 350, Modern Physics	3
PHYS 330 (MSUM), Intermediate Mechanics or PHYS 351, Mechanics I	4 or 3
PHYS 361, Electromagnetic Theory or PHYS 370 (MSUM), Electromag Theory	3 or 4
PHYS 370, Intro to Computational Physics	3
PHYS 462, Heat & Thermodynamics	3
PHYS 471, Adv Physics Lab	2
PHYS 485, Quantum Mechanics I	3
PHYS 486, Quantum Mechanics II	3
PHYS 489, Capstone - Senior Project	1
Total	57-59

Related Requirements	Credits
CSCI 160, Computer Science I	4
PHYS Electives ¹	3
Total	7

Additional Requirements	Credits
Free Electives (for degree completion)	3-11
Total	3-11

Curriculum Total (min) 122

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.

2 Refer to department or curriculum guide for course options.

3 May double count with select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech Gen Ed courses.

Sample '08-09 Curriculum Mathematics & Statistics Double Major

General Education Requirements	Credits
First Year Experience (F): UNIV 189, Skills for Academic Success	1
Communications (C): COMM 110, Fund of Public Speaking ENGL 110 ¹ , 120, College Comp I, II ENGL Upper Level Writing Course ²	3 3,3 3
Quantitative Reasoning (R): MATH 165, Calculus I	4
Science & Technology (S)	10
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B)	6
Wellness (W)	2
Cultural Diversity (D) ³	--
Global Perspective (G) ³	--
Total	41

College/Department Requirements	Credits
HUM/SOC SCI Electives (B.S. Degree)	6
HUM/SOC SCI Electives (B.A. Degree)	12
Second Year Lang Proficiency (B.A. Degree)	--
Total	6-12

Major/Related Requirements (both options)	Credits
MATH 166, Calculus II	4
MATH 265, Calculus III	4
MATH 266, Intro Diff Equations	3
MATH 270, Intro to Abstract math	3
MATH 429, Linear Algebra	3
MATH 450, Real Analysis I	3
STAT 330, Intro to Stats	3
STAT 461, Applied Regression Models	3
STAT 462, Intro to Experimental Design	3
STAT 467, Probability & Math Stats I	3
STAT 468, Probability & Math Stats II	3
CSCI 160, Computer Science I	3
CSCI 161, Computer Science II	3
Lab Science Sequence/Science Elective ²	10
Total	51

Option 1: General Double Major	Credits
MATH 420, Abstract Algebra I	3
MATH 451, Real Analysis II	3
STAT 476, Actuary Exam Study II or STAT 491, Capstone Seminar	1
STAT 400 Level Electives ²	12
CSCI Electives ²	6
Total	25

Option 2: Pre-Actuarial Science	Credits
ACCT 200, Elements of Accounting I	3
ACCT 201, Elements of Accounting II	3
ECON 201, Prin of Microeconomics ⁴	3
ECON 202, Prin of Macroeconomics ⁴	3
MATH 451, Real Analysis II or MATH 489, Numerical Analysis II	3
MATH 488, Numerical Analysis I	3
MATH 376, Actuarial Exam Study	1
STAT 476, Actuary Exam Study II	1
STAT 400 Level Electives ²	9
BUSN/ECON/CSCI Electives ²	9
Total	38

Curriculum Total (min) 122

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.

2 Refer to department guide for course options.

3 May double count with select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech Gen Ed courses.

4 Both courses will fulfill the Social & Behavioral Science and Global Perspective General Education requirements.

Sample '08-09 Curriculum Mathematics Education Major

General Education Requirements	Credits
First Year Experience (F): UNIV 189, Skills for Academic Success	1
Communications (C): COMM 110, Fund of Public Speaking ENGL 110 ¹ , 120, College Comp I, II ENGL Upper Level Writing Course ²	3 3,3 3
Quantitative Reasoning (R): MATH 165, Calculus I	4
Science & Technology (S)	10
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B)	6
Wellness (W)	2
Cultural Diversity (D) ³	--
Global Perspective (G) ³	--
Total	41

Major Requirements	Credits
CSCI 160, Computer Science I	4
MATH 166, Calculus II	4
MATH 265, Calculus III	4

MATH 270, Intro to Abstract Math.....3
 MATH 374, Special Problems in Math1
 MATH 420, Abstract Algebra I.....3
 MATH 429, Linear Algebra.....3
 MATH 440, Axiomatic Geometry3
 MATH 450, Real Analysis I.....3
 MATH 478, History of Mathematics.....3
 STAT 367, Probability3
 STAT 368, Statistics.....3
 MATH 300-400 Level Electives².....6
Total.....43

Professional Education Requirements Credits
 EDUC 321, Intro to Teaching3
 EDUC 322, Educational Psychology3
 EDUC 381, Early Experience.....1
 EDUC 451, Instruc, Planning, Meth & Assess3
 EDUC 481, Class Prac/Meth of Teach I-Math3
 EDUC 485, Student Teach Seminar1
 EDUC 486, Class Mgt of Diverse Learners2
 EDUC 487, Student Teaching9
 EDUC 488, Applied Student Teaching.....3
 EDUC 489, Nat American/Multicult Inst Prac.....3
Total.....31

Additional Requirements Credits
 Free Electives (for degree completion)7
Total.....7

Curriculum Total (min)..... 122

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.

2 Refer to department or curriculum guide for course options.

3 May double count with select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech Gen Ed courses.

Mathematics Minor

A minor in Mathematics requires 21 credits in select math courses. A grade of C or better is required in these courses. Contact the department for details.

Sample '08-09 Curriculum Mathematics Minor

Requirements Credits
 MATH 165, Calculus I.....4
 MATH 166, Calculus II.....4
 MATH 265, Calculus III.....4
 MATH 300-400 Level Electives¹9

Curriculum Total 21

1 Refer to department or curriculum guide for course options.

Department of Physics

www.ndsu.edu/ndsu/physics

Physics Major

Students who complete a major in Physics are prepared for careers in industrial and governmental research and development; for graduate study in physics, astronomy, engineering, medicine, oceanography, materials science; and for environmental science. In-depth preparation also is provided for teaching in secondary schools.

To meet requirements of the "No Child Left Behind" Act 2001, students interested in Physics Education are encouraged to declare a double major in their discipline and in education (i.e., physics education and physics). Such double majors may typically be earned by successful completion of a few additional credits. Students should contact their advisor or the Office of Registration and Records for details and are encouraged to declare their primary and secondary majors with the Office of Registration and Records, Ceres 110.

A grade-point average of 2.00 or higher is required in all physics courses. Courses do not count toward the major if the grade is less than a C.

Computational Physics Option

Computational physics is a rapidly growing sub-discipline of physics, concerned with computational aspects of physical problems, including computer simulation and numerical techniques for the solution of mathematical equations arising in all areas of physics. As computing power grows, computer modeling is becoming an increasingly important research and development tool. Correspondingly, there is a rising demand for scientists with multidisciplinary training that combines fundamental knowledge of physics with practical skills in computation. The computational physics option recognizes the unique qualifications of students who complete computation-related courses in addition to fulfilling the requirements for the physics majors. Graduates of the option will be qualified to work in industry or to pursue graduate studies in physics, computer science, engineering, or other technical fields.

Optical Science and Engineering Option

This program is for students who wish to prepare for a career as a physicist in photonics or for graduate school in optics or photonics. Today, light is at the core of technologies ranging from computing and communication to surgical techniques. There are more than 5,000 optics-related companies in the United States alone, but even more important, photonics provides the technical foundation for many more. Optical science and engineering has exploded to encompass nearly all fields of science and technology with a consequent shortage of individuals trained in the field. This option provides the necessary interdisciplinary background in physics and electrical engineering through a structured sequence of courses. This is the only program of this type in the region.

Sample '08-09 Curriculum Physics Major

General Education Requirements Credits
 First Year Experience (F):
 UNIV 189, Skills for Academic Success1
 Communications (C):
 COMM 110, Fund of Public Speaking.....3
 ENGL 110¹, 120, College Comp I, II.....3,3
 ENGL Upper Level Writing².....3
 Quantitative Reasoning (R):
 MATH 165, Calculus I.....4
 Science & Technology (S):
 PHYS 251, 251L, Univ Physics I, Lab.....4,1
 PHYS 252, 252L, Univ Physics II, Lab.....4,1
 Humanities & Fine Arts (A)6
 Social & Behavioral Sciences (B)6
 Wellness (W).....2
 Cultural Diversity (D)³.....--
 Global Perspective (G)³.....--
Total.....41

College/Department Requirements Credits
 HUM/SOC SCI Electives (B.S. Degree)6
 HUM/SOC SCI Electives (B.A. Degree).....12
 Second Year Lang Proficiency (B.A. Degree)--
Total.....6-12

Major/Related Requirements (all options) Credits
 PHYS 251R, Univ Physics I, Recitation.....1
 PHYS 252R, Univ Physics II, Recitation.....1
 PHYS 350, Modern Physics3
 PHYS 330 (MSUM), Intermediate Mechanics or
 PHYS 351, Mechanics I⁴4 or 3
 PHYS 361, Electromagnetic Theory or
 PHYS 370 (MSUM), Electromag Theory3 or 4
 PHYS 370, Intro to Computational Physics.....3

PHYS 411, 411L, Optics for Sci & Engr, Lab3,1
 PHYS 462, Heat & Thermodynamics.....3
 PHYS 471, Adv Physics Lab2
 PHYS 485, Quantum Mechanics I3
 PHYS 486, Quantum Mechanics II3
 PHYS 489, Capstone - Senior Project3
 MATH 166, Calculus II.....4
 MATH 265, Calculus III.....4
 MATH 266, Intro to Differential Equations.....3
 MATH 400 Level Electives²6
 CHEM Electives².....6
Total..... 55-57

Option 1: General Physics Credits
 PHYS Electives²4-6
Total.....4-6

Option 2: Computational Physics Credits
 PHYS 463, Statistical Mechanics.....3
 PHYS Electives²3
 CSCI 160, Computer Science I4
 CSCI 161, Computer Science II4
 ECE 173, Intro to Computing3
 STAT 367, Probability3
 STAT 368, Statistics.....3
Total..... 23

Option 3: Optical Science/Engineering Credits
 PHYS 413, Lasers for Scientists & Engineers3
 PHYS 415, Elements of Photonics3
 ECE 173, Intro to Computing3
 EE 206, Circuit Analysis I4
 Recommended Courses:
 ECE 311, Circuit Analysis II.....4
 ECE 321, Electronics I5
 ECE 417, Optical Signal Transmission.....3
 ECE 483, Instrumentation for Engineers.....3
Total..... 13-28

Curriculum Total (min) - All Options 122

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.

2 Refer to department or curriculum guide for course options.

3 May double count with select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech Gen Ed courses.

4 May substitute with PHYS 755, Classical Mechanics I, with department permission.

Sample '08-09 Curriculum Physics Education Major

General Education Requirements Credits
 First Year Experience (F):
 UNIV 189, Skills for Academic Success1
 Communications (C):
 COMM 110, Fund of Public Speaking.....3
 ENGL 110¹, 120, College Comp I, II.....3,3
 ENGL 324, Writing in the Sciences.....3
 Quantitative Reasoning (R):
 MATH 165, Calculus I.....4
 Science & Technology (S):
 CSCI 114, Microcomputer Packages or
 CSCI 116, Busn Use of Computers.....3 or 4
 BIOL 124, 124L, Environ. Biology, Lab.....3,1
 CHEM 121, Gen Chem I3
 Humanities & Fine Arts (A)6
 Social & Behavioral Sciences (B)6
 Wellness (W).....2
 Cultural Diversity (D)³.....--
 Global Perspective (G):.....--
 GEOL 105, Physical Geology--
Total..... 41-42

College/Department Requirements	Credits
CHEM 121L, Gen Chem I Lab	1
STAT 330, Intro Stats	3
Total	4

Major Requirements	Credits
CHEM 122, 122L, Gen Chem II, Lab	3,1
CHEM Elective ²	4
GEOL 105, 105L, Physical Geology, Lab	3,1
GEOL 106, 106L, Earth Through Time, Lab	3,1
MATH 166, Calculus II	4
MATH 265, Calculus III	4
MATH 266, Intro to Differential Equations	3
PHYS 110, Intro Astronomy	3
PHYS 251, 251L, Univ Physics I, Lab	4,1
PHYS 252, 252L, Univ Physics II, Lab	4,1
PHYS 350, Modern Physics	3
PHYS 351, Mechanics I	3
PHYS 361, Electromagnetic Theory	4
PHYS 411, 411L, Optics/Scientists & Engr	3,1
PHYS 462, Heat & Thermodynamics	3
PHYS 471, Adv Physics Lab	2
PHYS 485, Quantum Mechanics I	3
PHYS 491, Seminar	1
PHYS Electives ³	6
Total	69

Professional Education Requirements	Credits
EDUC 321, Intro to Teaching	3
EDUC 322, Educational Psychology	3
EDUC 381, Early Experience	1
EDUC 451, Instruc, Planning, Meth & Assess	3
EDUC 481, Classrm Prac/Meth of Teach I-Sci	3
EDUC 485, Student Teach Seminar	1
EDUC 486, Classrm Mgt of Diverse Learners	2
EDUC 487, Student Teaching	9
EDUC 488, Applied Student Teaching	3
EDUC 489, Nat American/Multicult Inst Prac	3
Total	31

Curriculum Total 145-146

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.

2 May double count with select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech Gen Ed courses.

3 Refer to department or curriculum guide for course options.

Mathematics and Physics Double Major

This program is for students who want additional theoretical background and preparation for graduate or technical careers in the sciences. See sample curriculum under Mathematics.

Physics Minor

A Physics minor consists of 19 credits. At least 8 credits must be taken at NDSU.

Sample '08-09 Curriculum Physics Minor

Requirements	Credits
PHYS 251, 251L, Univ Physics I, Lab	4,1
PHYS 252, 252L, Univ Physics II, Lab	4,1
PHYS 251R, Univ Physics I, Recitation	1
PHYS 252R, Univ Physics II, Recitation	1
PHYS 350, Modern Physics	3
PHYS 300-400 Level Electives ¹	6

Curriculum Total 21

1 Refer to department or curriculum guide for course options.

Department of Psychology

www.ndsu.edu/psych

Psychology is concerned with behavior, both of human beings and other living organisms. In studying behavior, psychologists rely heavily upon the methods of science. Some areas of psychology are most closely related to the natural and biological sciences while other areas within psychology are more closely related to the social sciences, especially sociology, anthropology, and communication. Both an undergraduate major and an undergraduate minor in psychology are available. Psychology majors may select the degree program that best suits their needs and interests from the B.A. and B.S. tracks outlined in this section.

All majors must complete 30 credits in psychology as listed in the outline for the B.S. degree. Additional courses in psychology may be selected, in consultation with the advisor, from any of those listed under the department's offerings. Courses in the major field may not be taken on a pass/fail basis (except PSYC 494 and 496, which may be graded on a pass/fail basis by the instructor).

The psychology major also requires a supporting track in one of the following areas:

1. Natural Science Track: 14 additional credits in math, computer science, statistics, and/or science
2. Social Science Track: 14 additional credits in social science (other than psychology)
3. A minor in an approved area of study

Career Orientation Overlays

An undergraduate education in psychology leads to a number of career choices following graduation. To assist students in preparing for post-graduate work and careers in psychology or related fields, the department has prepared several Career Orientation OverLays (COOLs). COOLs establish curriculum guidelines and suggestions for students who may be interested in a variety of careers, including medicine and neurosciences, business and industry, graduate school in psychology, or mental health and applied psychology. COOLs, when used in conjunction with the counsel of an advisor, are intended to help a student select the best courses within and outside of psychology (e.g., biology for medicine or business for industrial psychology) to suit particular interests and career goals.

Advising Centers

Information for students is available on the department web site and at the department in Minard Hall. Topics include requirements for majors and minors, COOLs, graduate school, and career information.

Psychology Major

A total of 122 credits is required for a major in psychology leading toward a Bachelor of Science or Bachelor of Arts degree. The following requirements must be fulfilled:

Sample '08-09 Curriculum Psychology Major

General Education Requirements	Credits
First Year Experience (F):	
UNIV 189, Skills for Academic Success	1
Communications (C):	
COMM 110, Fund of Public Speaking	3
ENGL 110 ¹ , 120, College Comp I, II	3,3
ENGL 324, Writing in the Sciences or	
ENGL 325, Writing in Health Profess or	
ENGL 459, Research/Writing Grants	3
Quantitative Reasoning (R):	
STAT 330, Intro Statistics	3
Science & Technology (S)	10
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B)	6

Wellness (W)	2
Cultural Diversity (D) ²	--
Global Perspective (G) ²	--
Total	40

College/Department Requirements	Credits
HUM/SOC SCI Electives (B.S. Degree)	6
HUM/SOC SCI Electives (B.A. Degree)	12
Second Year Lang Proficiency (B.A. Degree)	--
Total	6-12

Major Requirements	Credits
PSYC 111, Intro to Psychology	3
PSYC 350, Research Methods I	3
PSYC 351, Research Methods II	3
400 level Psychology Electives ³	15
Additional Psychology Electives ³	6
Total	30

Related Requirements	Credits
MATH 103 or Higher	3-4
STAT 330, Intro Stats	3
Supporting Track/Minor Electives	14-21
Total	20-28

Additional Requirements	Credits
Free Electives (for degree completion)	12-26
Total	12-26

Curriculum Total (min) 122

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.

2 May double count with select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech Gen Ed courses.

3 Refer to department or curriculum guide for course options.

Note: The particular sequence of courses a student chooses will depend upon his or her interests. In choosing electives, a student must satisfy the general requirements for a B.A. or B.S. degree.

Psychology Minor

A minor in Psychology offers students electing majors in other disciplines the opportunity to complement their studies with a coherent set of psychology courses. Different courses are compatible with interests and career goals of students in major areas such as business, child development and family science, and computer science. Students planning a Psychology minor should consult with a faculty advisor from the Department of Psychology.

Students selecting a minor in Psychology must complete 18 credits in psychology (excluding PSYC 494 or 496). These 18 semester credits may not be taken pass/fail and must include at least one 3-credit 300- or 400-level course. A minimum of eight credits must be taken at NDSU.

Sample '08-09 Curriculum Psychology Minor

Requirements	Credits
PSYC 111, Intro to Psychology	3
PSYC Electives ¹	15
Total	18

1 Refer to department or curriculum guide for course options.

Neuroscience Minor

A 17 credit minor in Neuroscience is also available. See the department of Psychology for details.

Department of Statistics

www.ndsu.edu/statistics

Statistics involve the analysis of numerical data. This ranges from the calculation of simple statistics to the mathematical theory behind very sophisticated statistical procedures. Professionals in areas such as agriculture, pharmacy, business, human development, and the social sciences use statistical tools.

The Department of Statistics offers a major leading to a B.S., M.S., or Ph.D. degree, as well as minors in Statistics for both undergraduate and graduate students. The program is flexible enough to be individually planned around prior experience and in accord with professional goals. The program emphasis is on applied statistics, consulting, and computational methods.

Sample '08-09 Curriculum Statistics Major

General Education Requirements Credits

First Year Experience (F):	
UNIV 189, Skills for Academic Success	1
Communications (C):	
COMM 110, Fund of Public Speaking	3
ENGL 110 ¹ , 120, College Comp I, II	3,3
ENGL Upper Level Writing Course ²	3
Quantitative Reasoning (R):	
MATH 165, Calculus I	4
Science & Technology (S)	10
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B)	6
Wellness (W)	2
Cultural Diversity (D) ³	--
Global Perspective (G) ³	--
Total	41

College/Department Requirements Credits

HUM/SOC SCI Electives (B.S. Degree)	6
HUM/SOC SCI Electives (B.A. Degree)	12
Second Year Lang Proficiency (B.A. Degree)	--
Total	6-12

Major Requirements Credits

STAT 367, Probability	3
STAT 368, Statistics	3
STAT 461, Applied Regression Models	3
STAT 462, Intro/Experimental Design	3
STAT 476, Actuary Exam Study II or STAT 491, Capstone Seminar	1
CSCI/MATH/STAT Electives ²	15
Total	28

Related Requirements Credits

CSCI 126, Beginning FORTRAN or CSCI 160, Computer Science I or CSCI 227, Comput Fundamentals I	3 or 4
CSCI 222, Discrete Math or MATH 270, Intro to Abstract Math	3
MATH 129, Linear Algebra	2
MATH 166, Calculus II	4
MATH 265, Calculus III	4
Total	16-17

Additional Requirements Credits

Free Electives (for degree completion)	24-31
Total	24-31

Curriculum Total (min)

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.

2 Refer to department or curriculum guide for course options.

3 May double count with select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech Gen Ed courses.

Mathematics and Statistics Double Major

Pre-Actuarial Science Option

Actuarial science is the study of the evaluation and measurement of risk. The Actuary Science option is a pre-professional program designed to provide the background needed to enter the field. Entrance into the profession is regulated under a system of examinations run by actuarial professional societies. The curriculum for this option is designed to prepare the student to pass several of these examinations.

The nature of the actuarial profession requires its practitioners to have a broad knowledge of finance, law, mathematics, management, and statistics. This option leads to a double major in Mathematics and Statistics with either a minor in Economics or additional courses in business. Students selecting this option are requested to visit with the actuarial advisors in both the Departments of Mathematics and Statistics early and often to confirm their progress and to inform themselves of changes in the examination curriculum. See sample curriculum under Mathematics.

Behavioral Statistics Major

This degree is a joint effort between the Department of Statistics and the Department of Psychology. It is recommended that a student wishing to obtain a degree in Behavioral Statistics consult with an advisor in both departments. This major prepares students for careers involving collecting and analyzing data on human behavior, for example, in Medicare, insurance, market research, or health, educational and social services. Graduates of this program are expected to have good quantitative reasoning skills and to have strong people skills. Note: this curriculum also fulfills requirements for the B.S. in Psychology. See the sample curriculum for this degree.

Sample '08-09 Curriculum Behavioral Statistics Major

General Education Requirements Credits

First Year Experience (F):	
UNIV 189, Skills for Academic Success	1
Communications (C):	
COMM 110, Fund of Public Speaking	3
ENGL 110 ¹ , 120, College Comp I, II	3,3
ENGL Upper Level Writing ²	3
Quantitative Reasoning (R):	
STAT 330, Intro to Statistics	3
Science & Technology (S):	
BIOL 126, Human Biology	3
CHEM 117, 117L, Chem Cpt & App, Lab	3,1
CSCI 114, Microcomputer Packages or CSCI 116, Busn Use of Computers	3-4
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B):	
ANTH, Intro to Anthropology	3
SOC 110, Intro to Sociology	3
Wellness (W)	2
Cultural Diversity (D) ³	--
ANTH, Intro to Anthropology	--
Global Perspective (G) ³	--
Total	40-41

College/Department Requirements Credits

HUM/SOC SCI Electives (B.S. Degree)	6
HUM/SOC SCI Electives (B.A. Degree)	12
Second Year Lang Proficiency (B.A. Degree)	--
Total	6-12

Major Requirements Credits

PSYC 111, Intro to Psychology	3
PSYC 200 Level Electives ²	9
PSYC 200-300 Level Electives ²	6
PSYC 350, Research Methods I	3
PSYC 350, Research Methods I	3
PSYC 351, Research Methods II	3
PSYC 400 Level Electives ²	6

STAT 331, Regression Analysis	2
STAT 462, Intro to Experimental Design	3
STAT 470, Statistical SAS Programming	3
PSYC/STAT 480, History & Systems or PSYC/STAT 489, Honor's or PSYC /STAT 491, Capstone Sem	1 or 3
Total	42-44

Related Requirements Credits

MATH 103, College Algebra or MATH 104, Finite Math	3
PSYC Behavior Electives ²	9
STAT Elective ¹	6
Total	18

Additional Requirements Credits

Free Electives (for degree completion)	7-16
Total	7-16

Curriculum Total (min)

1 Effective fall 2007, students with composite ACT scores of 21 or higher should register for English 120 (unless transfer credit for ENGL 120 is received). Students who complete English 120 with a C or higher will receive credit for English 110 with a passing grade (P). Students with a composite ACT score of less than 21 are required to register for English 110.

2 Refer to department or curriculum guide for course options.

3 May double count with select Humanities & Fine Arts, Social & Behavioral Science and/or Science & Tech Gen Ed courses.

Note: Students must meet the university's general education requirements as well as the curriculum requirements in effect at the time of entrance into a program.

Statistics Minors

Two different minors in Statistics are offered. A Department of Statistics (Waldron 201) advisor for minors must approve the program.

Sample '08-09 Curriculum Applied Statistics Minor

Requirements Credits

STAT 330, Intro to Stats	3
STAT 331, Regression Analysis	2
STAT 400 Level Electives ¹	12

Curriculum Total

1 Refer to department or curriculum guide for course options.

Sample '08-09 Curriculum Statistics Minor

Requirements Credits

MATH 165, Calculus I	4
MATH 166, Calculus II	4
STAT 331, Regression Analysis or STAT 461, Applied Regression Models	2-3
STAT 367, Probability	3
STAT 368, Statistics	3
STAT 462, Intro to Experimental Design	3
STAT 400 Level Elective ¹	3

Curriculum Total

1 Refer to department or curriculum guide for course options.