

INTERDISCIPLINARY PROGRAMS

Interdisciplinary study involves an integration of more than one discipline and perspective on a topic. North Dakota State University offers several interdisciplinary programs at both the undergraduate and graduate levels. The undergraduate programs listed in this section are offered through collaborative partnerships of departments in more than one academic college. Programs offered by multiple departments within the same academic college are listed in their respective college sections.

Biotechnology

www.ag.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. The methodologies include the use of recombinant DNA for gene cloning and gene transfers between organisms, culture of plant and animal cells and tissues, fusion of animal cells or plant protoplasts, and the regeneration of whole plants from single cells.

Biotechnology also is concerned with the large-scale fermentation processes that utilize some of these novel organisms for the production of pharmaceuticals, diagnostic tests for diseases, feed additives, enzymes, and hormones.

Biotechnology offers seemingly unlimited opportunities to combine genes from related or unrelated species to produce useful organisms with desirable properties that were not previously found in nature. The development of crop plants that are resistant to herbicides or insects, the production of human growth hormone and insulin by genetically engineered bacteria, and the development of unique vaccines are all examples of successful biotechnology.

The Biotechnology program is offered in either the College of Agriculture, Food Systems, and Natural Resources or the College of Science and Mathematics and leads to the Bachelor of Science degree. The curriculum is designed to provide students with knowledge and experience in both basic and applied sciences. Students have an opportunity to work with scientists in various areas including, animal science, biology, botany, chemistry, horticulture, microbiology, plant pathology, plant science, and zoology. Faculty in each of the cooperating life-science departments has been identified to serve as advisors for students who select the biotechnology major. Graduates of this program have excellent opportunities for employment in the biotechnology industry or for graduate education.

Students majoring in biotechnology are required to perform a research project in the laboratory of a faculty member/scientist, and to prepare a senior thesis describing their research project. A 2.50 institutional grade-point average is required to remain in the program.



Sample '08-09 Curriculum Biotechnology 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 Composition I, II	6
ENGL Upper Level Writing Course ²	3
Quantitative Reasoning (R):	
STAT 330, Intro Stats	3
Science & Technology (S):	
BIOL 150, 150L, Gen Biology I, Lab	3,1
CHEM 121, 121L, Gen Chemistry I, Lab	3,1
CHEM 122, 122L, Gen Chemistry I, Lab	3,1
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B)	6
Wellness (W)	2
Cultural Diversity (D) ³	--
Global Perspective (G) ³	--
Total	42

Major Requirements	Credits
BIOL 151, 151L, Gen Biology II & Lab	3,1
CHEM 341, 341L, Organic Chemistry I/Lab	3,1
CHEM 432, Organic Chemistry II	3
MATH 146, 147, Applied Calculus I, II	4,4
MICR 350, 350L, Gen Microbiology & Lab	3,1
MICR 470, Basic Immunology	3
MICR 471, Immunology & Serology Lab	2
MICR 482, Bacterial Genetics & Phage	3
PHYS 211, 211L, College Physics I & Lab	3,1
PHYS 212, 212L, College Physics II & Lab	3,1
PLSC 315, 315L, Genetics & Lab	3,1
BIOC 460, 461, Found of Biochemistry & Molecular Biology I, II	8
BIOC 465, Prin of Physical Chem/Biophysics	4
BIOC 474, Meth in Recombinant DNA Tech	3
BOT 380, Plant Physiology or ZOO 460, Animal Physiology	4
Biotechnology Electives ²	4-6
Biotechnology Seminar	2

Senior Research	2-4
Senior Thesis	1
Total	71-75

Additional Requirements	Credits
Additional Arts/Hum or Soc/Behav Sci Electives	6
CSCI Elective	3
Electives	6
Total	15

Curriculum Total 128-132

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.

Biotechnology Minor

A minor in biotechnology requires satisfactory completion of 22 credits in the following courses. A minimum of eight credits must be taken at NDSU.

Sample '08-09 Curriculum Biotechnology Minor

Requirements	Credits
BIOC 460, Found of Bioch & Molec Bio I	4
BIOC 461, Found of Bioch& Molec Bio II	4
PLSC 315, 315L, Genetics & Lab	3,1
Biotechnology Technical Electives ¹	4
Specialized Electives ¹	6

Curriculum Total 22

1 Refer to department or curriculum guide for course options.

Fraud Investigation

The Department of Accounting and Information Systems, in collaboration with the Department of Criminal Justice and Political Science, offers a minor in Fraud Investigation. Students will study the causes of fraud, as well as the detection, investigation, and prevention of fraud. Students learn about the criminal justice system including law making, criminality, and prosecution of fraud and other types of crime. This minor will prepare students for possible careers in crime investigation, litigation support, or forensic accounting.

Contact the Department of Accounting and Information Systems or the Department of Criminal Justice and Political Science for specific course and minimum grade-point average requirements.

Gerontology

A minor in Gerontology is sponsored through the College of Human Development and Education and the College of Arts, Humanities and Social Sciences. It makes use of the Tri College University resources to provide students with an integrated understanding of the process of aging, aging services, and the aged in America. There are six basic areas of study. Students should follow the directions provided for each of the areas.

Sample '08-09 Curriculum Gerontology Minor

Requirements	Credits
SOC 440, Sociology of Aging.....	3
CDFS 460, Adult Development & Aging or PSYC 471, The Psychology of Aging.....	3
CDFS 182, Wellness & Aging.....	3
CDFS 481, Women & Aging or CDFS 482, Family Dynamics of Aging.....	3
Internship ¹	3
Elective ²	3

Curriculum Total (min)..... 18

1 Each student must complete the equivalent of three semester credits of internship-practicum. Please contact Dr. Dan Klenow or Dr. Greg Sanders for details. Students who have completed an internship related to Gerontology for their current major can request to substitute those credits for the required 3 credit elective.

2 Refer to department or curriculum guide for course options.

Great Plains Institute of Food Safety

www.ndsu.edu/foodsafety

An interdisciplinary team of faculty with expertise in food safety from various departments within NDSU's Colleges of: Agriculture, Food Systems, and Natural Resources; Arts, Humanities and Social Sciences; Human Development and Education; Engineering and Architecture, and Science and Mathematics has formed the Great Plains Institute of Food Safety and developed a unique educational experience for NDSU students. The comprehensive food safety curriculum leads to B.S., M.S., and Ph.D. degrees in Food Safety, an Undergraduate Minor in Food Safety and a Graduate Certificate in Food Protection (see website for complete curriculum requirements). All these programs are unified around the single issue of food safety, an area of concern for many Americans, the current target of tremendous interest, effort, and spending worldwide, and an area in which shortages of expertise are manifest. Students in food safety are heavily recruited for employment in the food safety fields.

The curriculum is based on contemporary educational theory and employs experiential learning techniques to foster development of students' critical-thinking abilities, collaborative and problem-solving skills, and awareness of employment opportunities. Courses are fully integrated so that students have the opportunity to troubleshoot food-safety issues from "farm-to-fork." The program promises to meet students' present and future educational needs.

Sample '08-09 Curriculum Food Safety Major

General Education Requirements	Credits
First Year Experience (F): AGRI 189, Skills for Academic Success.....	1
Communications (C): COMM 110, Fund of Public Speaking.....	3
ENGL 110 ¹ , 120, College Composition I, II.....	6
ENGL Upper Level Writing Course ²	3
Quantitative Reasoning (R): STAT 330, Intro Stats.....	3
Science & Technology (S): BIOL 150, 150L, Gen Biology I, Lab.....	3,1
CHEM 121, 121L, Gen Chemistry I, Lab.....	3,1
CHEM 122, 122L, Gen Chemistry I, Lab.....	3,1
Humanities & Fine Arts (A).....	6
Social & Behavioral Sciences (B): ECON 201, Principles of Microeconomics.....	3
ECON 202, Principles of Macroeconomics.....	3
Wellness (W).....	2
Cultural Diversity (D) ³	--
Global Perspective (G).....	--
ECON 201, Principles of Microeconomics.....	3
Total.....	42

Major Requirements	Credits
AGRI 150, Ag Orientation.....	1
ANSC 340, Meat Science & Technology.....	3
CFS 200, Intro to Food Systems or CFS, 210 Intro to Food Sci & Tech.....	3 or 2
CFS 460, 461, Food Chemistry, Lab or CFS 464, Food Analysis.....	3,1 or 3
CFS 370, Food Processing I or CFS 470, 471, Food Processing II, Lab.....	3 or 3,1
MICR 350, 350L, Gen Microbiology I, Lab.....	3,1
SAFE 401, Food Safety Info & Flow of Food.....	1
SAFE 402, Foodborne Hazards.....	1
SAFE 403, Food Safety Risk Assessment.....	1
SAFE 404, Epidem of Foodborne Illness.....	1
SAFE 405, Costs of Food Safety.....	1
SAFE 406, Food Safety Crisis Comm.....	1
SAFE 407, Food Safety Risk Management.....	1
SAFE 408, Food Safety Regulatory Issues.....	1
SAFE 409, Food Safety Risk Comm & Educ.....	1
SAFE 452, Food Laws & Regulations.....	3
SAFE/MICR 474, Epidemiology.....	3
SAFE 484, Food Safety Practicum.....	1-3
SAFE/COMM 485, Crisis Communication.....	3
Total.....	35-40

Additional Requirements	Credits
BIOC 260, Elements of Biochemistry or BIOC 460, Found of Biochem & Molec Biol I.....	4
CHEM 341, 341L, Organic Chem I, Lab.....	3,1
MATH 105, Trigonometry or MATH 146, Applied Calc I or MATH 165, Calculus I.....	3 or 4
PHYS 211, 211L, College Physics I, Lab.....	3,1
Electives (for degree completion).....	30-36
Total.....	42-47

Curriculum Total..... 128

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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.

Food Safety Minor

Students may minor in Food Safety by completing a total of 16 credits. A minimum of eight credits must be taken at NDSU.

Sample '08-09 Curriculum Food Safety Minor

Requirements	Credits
SAFE 401, Food Safety Info & Flow of Food.....	1
SAFE 402, Foodborne Hazards.....	1
SAFE 403, Food Safety Risk Assessment.....	1
SAFE 404, Epidem of Foodborne Illness.....	1
SAFE 405, Costs of Food Safety.....	1
SAFE 406, Food Safety Crisis Comm.....	1
SAFE 407, Food Safety Risk Management.....	1
SAFE 408, Food Safety Regulatory Issues.....	1
SAFE 409, Food Safety Risk Comm & Educ.....	1
SAFE Electives ¹	7

Curriculum Total..... 16

1 Refer to department or curriculum guide for course options.

International Studies

The International Studies major is a secondary major that is offered concurrently with a student's primary program of study. This program provides students with the opportunity to internationalize their major by combining special requirements to obtain the international studies major with their academic field of study. Students complete 27 credits of course work including an integrative senior project, demonstrate proficiency in a foreign language, and participate in an experience abroad to complete a second major in International Studies.

Courses. In addition to the courses required for the primary major, students seeking the International Studies major are required to take courses that have an international focus. These include a 12-credit core and nine credits of electives that will be chosen with the help of the student's advisor. An integrative senior project that ties international study to the primary degree also is required.

Languages. Knowledge of a foreign language is an important part of the program. At NDSU students may study Arabic, French, German, and Spanish. Additional language study is available through the Tri-College University in languages such as Norwegian, Russian, Japanese, and Chinese. Foreign language proficiency equivalent to completion of two years of college language study is required. This requirement may be met either through appropriate course work or through a testing procedure in the Department of Modern Languages.

Experience abroad. An important part of the International Studies major is participation in a study, work, or research experience abroad for at least 10 weeks in duration. Assistance with finding an overseas study program is available in the Office of International Programs.

Selective admission. To be eligible to participate in the International Studies major, students must have sophomore standing with a minimum grade-point average of 2.5. Eligible students also must have initiated advanced level course work in their academic major and completed the first year or equivalent of their foreign language study. Additional information about the International Studies major and curriculum requirements are available through the department of a student's academic major, the college International Studies advisor, the Department of Modern Languages, and the Office of International Programs.

Logistics Management

Working in conjunction, the College of Business, the Upper Great Plains Transportation Institute, and the Department of Agribusiness and Applied Economics offer a minor in Logistics Management. Companies directly involved with transportation as well as companies in the retail and wholesale sectors increasingly rely on an effective and efficient logistics system to remain competitive. In addition, the public sector also utilizes individuals with logistics and supply chain management skills.

Sample '08-09 Curriculum Logistics Management Minor

Requirements	Credits
BUSN 350, Foundations of Management	3
BUSN 481, Supply Chain Management	3
BUSN 491, Seminar	1
AGEC 378, Intro to Transportation & Logistics	3
IME 470, Operations Research I	3
IME 480, Production & Inventory Control	3
Approved Elective	3
Curriculum Total	19

In addition, students must earn a 2.50 cumulative grade-point average based upon the courses used in the minor. A minor approval form and fee are required.

Natural Resources Management

www.ag.ndsu.nodak.edu/nrm

With increasing human pressure and a growing need to balance competing demands, our world needs new and better ways to manage society's impacts on the environment. The Natural Resources Management program prepares students for challenging careers requiring the holistic ecological perspective and global social perspective necessary for examining and solving complex natural resources management problems. Our goal is the highest and best societal uses of natural resources while maintaining the integrity of life-sustaining ecological systems. Career opportunities abound in federal, state and local government, the private sector, non-profit conservation and environmental organizations, as well as higher education and research.

An interdisciplinary major in NRM leads to a Bachelor of Science (BS) degree. Students benefit from faculty engagement from four colleges in the coordination of the program, classroom teaching and advising. Students may earn a B.S. degree from any one of the participating colleges: College of Agriculture, Food Systems, and Natural Resources; College of Engineering and Architecture; and College of Science and Mathematics.

During the first four semesters of the NRM program, students complete a broad foundation of core courses in the social, biological, and physical sciences. The second half of the program offers students the opportunity to focus on a specific area of interest (emphasis). NRM offers six emphasis areas, each allowing students the flexibility to select courses for specialized career preparation.

Biotic Resources Science deals with basic scientific principles that govern the interrelationship between biotic (e.g., plants, animals) and abiotic factors (e.g., climate, soils) in major ecosystems and the use of these principles for environmentally sound management of both natural and agro-ecosystems.

Environmental Communication is designed for environmentally oriented students preparing for careers in communication fields such as journalism, public relations, broadcast media and the internet.

Natural Resources Economics prepares students for management, administrative, regulatory, and policy positions that require a broad understanding of natural resources management and allocation.

Physical/Earth Resources Science leads to an understanding of the physical and chemical aspects of ecosystems. Topics of study include hydrology, water management and quality, waste management, soil properties, energy resources and land-use management.

Pollution Control focuses on the principles and practices of managing natural resources for pollution control. Topics include the technical aspects of pollution as they relate to water, air/solids, earth/soils, and the impact of environmental pollution on biotic factors. Students interested in this emphasis are strongly urged to complete College Algebra before entering the NRM program.

Social Sciences concentrates on human factors (social, political, anthropological) in environmental management and environmental disaster management, while recognizing constraints and opportunities presented by physical and biological factors.

Sample '08-09 Curriculum Natural Resources Management Major

General Education Requirement	Credits
First Year Experience (F):	
AGRI 189, Skills for Academic Success	1
Communications (C):	
COMM 110, Fund of Public Speaking	3
ENGL 110 ¹ , 120, College Composition I, II	6
ENGL Upper Level Writing Course ²	3
Quantitative Reasoning (R):	
STAT 330, Intro Stats	3
Science & Technology (S):	
BIOL 111, 111L, Concepts of Biology, Lab	3,1
BIOL 124, Environmental Science	3
GEOL 105, Physical Geology	3
Humanities & Fine Arts (A)	6
Social & Behavioral Sciences (B):	
ECON 201, Principles of Microeconomics	3
POLS 110, Intro to Political Science or	
SOC 110, Intro to Sociology	3
Wellness (W)	2
Cultural Diversity (D) ³	--
Global Perspective (G)	--
GEOL 105, Physical Geology	3
Total	40

Major Requirements	Credits
NRM 150, NRM Orientation	1
NRM 225, Natural Resources/Agro-Ecosys	3
SOIL 210, Intro to Soil Science	3
BIOL 151, 151L, General Biology II, Lab	3,1
CHEM 117, 117L, Chem Concepts & Appl	3,1
BIOL 364, General Ecology	3
CHEM 121, 121L, Gen Chemistry I, Lab	3,1
NRM 264, Nat Resource Mgmt Sys	3
ECON 481, Nat Resource Economics	3
POLS 215, Prob/Policies in Amer Govt or	
POLS 360, Prin of Public Admin or	
POLS 422, State & Local Politics	3
HIST 333, US Environmental History or	
HIST 434, Hist of Environmental Science	3
RNG 452, GIS in Range Survey or	
GEOG 455, Intro to Graphic Info Systems	3
NRM 431, NEPA & Env Impact Assessment	2
NRM 491, Seminar (capstone)	2
Emphasis Electives ²	38
Total	76

Additional Requirements	Credits
SOC 110, Intro to Sociology &	
SOC 431, Environmental Sociology or	
POLS 110, Intro to Political Science &	
POLS 453, Environ. Policy & Politics	3,3
Free Electives	6
Total	12

Curriculum Total 128

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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.

Natural Resources Management Minor

Students may minor in NRM by completing a minimum of 18 credits. Six of those credits are required courses and an additional three credits from each of the following interdisciplinary categories is also required: Biotic Resources Science, Physical/Earth Science, and the Social Sciences Sections I and II. A minimum of eight credits must be taken at NDSU. A minor approval form is available from the NRM Student Services Office.

Sample '08-09 Curriculum Natural Resources Management Minor

Requirements	Credits
NRM 150, NRM Orientation	1
NRM 225, Nat Resources/Agro-Ecosystems	3
NRM 431, NEPA & Env Impact ASMNT	2
Interdisciplinary Courses ¹	12

Curriculum Total 18

¹ Refer to department or curriculum guide for course options.

Women's Studies

www.ndsu.edu/womens_studies

The goals of Women's Studies include:

Examining the contributions of women to all aspects of society; exploring the intersections of race, class, sexual orientation, age, and physical ability with gender both globally and nationally; investigating the heritage, challenges and concerns of women; and providing a newer and broader understanding of women in all fields.

A Women's Studies program provides the benefits of a liberal arts education with an emphasis on critical thinking, writing, and organizational skills, making oral presentations, and expands the traditional acknowledgement that a liberal education produces well-rounded individuals. There also are multiple practical applications of a Women's Studies major. With more women in the workplace, businesses must be able to address issues such as sexual harassment, flex-time, and equal opportunity not only with sensitivity but from a knowledge base.

Women's Studies Major

The major consists of 36 credits, including a 15 credit core, nine hours of general Women's Studies elective classes, and 12 hours of topic-intensive work. (Women and Liberal Arts, Women and Families, Women and Health, Women and Work, and Women and Public Policy). Many of the courses in the topic-intensive electives are at Concordia College and MSUM.

Sample '08-09 Curriculum Women's Studies 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 Composition I, II	6
ENGL Upper Level Writing Course ²	3
Quantitative Reasoning (R)	3
Science & Technology (S)	10
Humanities & Fine Arts (A)	6
Including: WS 110, Intro to Women's Studies	
Social & Behavioral Sciences (B)	6
Including: Soc 412, Sociology of Sex Roles	
Wellness (W)	2
Cultural Diversity (D)	--
WS 110, Intro to Women's Studies	
SOC 412, Sociology of Sex Roles	
Global Perspective (G) ³	--
Total	40

College/Department Requirements	Credits
Humanities Elective	3
Social Science Elective	3
Fine Arts Elective	3
AHSS Elective (outside of major area)	3
Total	12

Major Requirements	Credits
WS 350, Perspectives in Women's Studies	3
WS 489, Internship/Capstone	3
SOC 424, Feminist Theory & Discourse	3
WS Electives ²	9
Topic Electives ²	12
Total	30

Additional Requirements	Credits
Free Electives (for degree completion)	40
Total	40

Curriculum Total (min) 122

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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.

Women's Studies Minor

The Women's Studies minor is an interdisciplinary program appropriate as a complement to various majors. This minor is particularly useful in acquiring perspectives that complement traditional studies for developing leadership roles or for pursuing careers that involve women's concerns. A student selecting this minor must complete the following requirements:

Sample '08-09 Curriculum Women's Studies Minor

Requirements	Credits
WS 110, Intro to Women's Studies	3
Core Courses ¹	9
Electives ¹	6

Curriculum Total 18

¹ Refer to department or curriculum guide for course options.

At least three credits must be taken in each of the two colleges offering the minor – the College of Arts, Humanities and Social Sciences and the College of Human Development and Education.