NDSU NORTH DAKOTA STATE UNIVERSITY

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ENGINEERING PROGRAMS

Many new college students are undecided on the particular branch of engineering in which they wish to enroll. These students work with a general engineering advisor and are encouraged to enroll in a 1-credit introduction to engineering course to become better acquainted with the engineering profession and its various disciplines. Students typically enroll in other general math and science courses that will prepare them for advanced engineering courses and which typically count towards graduation requirements for each of the engineering majors.

Students may officially declare a major as soon as they decide what field best matches their interests. It is best to make that decision within the first year of coursework at NDSU. In order to transfer to a specific major, a minimum grade point average (GPA) is required for construction engineering (2.5 GPA), and mechanical engineering (2.7 GPA). The engineering programs available at NDSU are listed below. Specific fact sheets describing these engineering majors are available from the Office of Admission.

Engineers are employed in every major industry in every state; they work in small and large cities, as well as in rural areas. Engineers work in manufacturing, infrastructure engineering for buildings and public facilities, and in scientific research and development services. Many engineers work in the construction, transportation, telecommunications and utilities industries. Federal, state and local governments are major employers of engineers. For example, federal engineering employers include the U.S. Departments of Defense, Transportation, Agriculture, Interior, and Energy as well as the National Aeronautics and Space Administration. Many engineers in state and local government agencies work in highway and public works departments. Many engineers are also self-employed as consultants.

Agricultural and Biosystems Engineering - Agricultural and biosystems engineers work in a wide variety of industries to address society's grand challenges in food, energy, and water. The Agricultural and Biosystems Engineering (ABEN) program prepares students for careers in:

-Machine Systems -Natural Resources and Environmental Systems
-Processing Systems (for food, biofuels, and other bioproducts)

Students can choose elective courses in biological or agricultural sciences and other engineering departments based on their professional goals. Graduates design systems and solve problems requiring mathematics and the application of physical, biological, and engineering sciences involving biological systems.

Civil Engineering - Civil engineers plan and design the infrastructure that sustains life and society. This includes planning and design for airports, canals, harbors, roads, bridges, railroads, water and wastewater treatment facilities, water supply and solid waste disposal facilities. Civil engineers are often involved with a wide range of projects in the areas of:

-structural engineering -environmental engineering
-geotechnical engineering -water resources engineering
-transportation engineering

In addition to consulting engineering firms, civil engineers are commonly employed with cities, state departments of transportation and federal agencies such as the Corps of Engineers.

Computer Engineering - Computer engineers work on both hardware and software aspects of computer systems. Students take essential electrical engineering classes along with specialized classes in computer engineering and computer science. Demand for computer engineers is strong due to the growing use of computers in all products and the need for engineers competent with computers in both hardware and software. Areas of specialization for computer engineering:

-Computer Architecture/Digital VLSI -Embedded Systems
-Cyber-Physical Systems

Construction Engineering - Construction engineers plan, design and manage construction projects of all types including buildings, highways, bridges, airports, railroads, dams and reservoirs. Responsibilities in construction engineering include design of permanent and temporary structures, cost estimating, project scheduling and control, materials procurement and selection of equipment. Construction engineers must be well versed in engineering design and management principles, business practices, financing and economics, and human behavior.

Electrical Engineering - Electrical engineers design systems and solve problems relating to all aspects of electricity – from production and storage to transmission to use in computer systems. The profession is broad, encompassing products valued by society in many technical specialties. Areas of specialization for electrical engineering include:

-Biomedical Engineering -Electromagnetics
-Communication & Signal Processing -Electronics & Microelectronics
-Control Engineering -Power Systems

Environmental Engineering - Environmental engineers integrate and apply biological, chemical, and engineering principles to improve and sustain the environment for the protection of its ecosystems, human health, and environmentally-related enhancement of the quality of life. The discipline focuses on water and wastewater treatment system design and public health protection; traditional and emerging contaminant mitigation in water, soil, and air; ecological principles in the design process; green manufacturing; and, sustainable design. Environmental engineers will play a crucial role in numerous 21st century challenges, including: sustainability of food, water, and energy; designing a future without pollution and waste; creating efficient, healthy, and resilient cities; fostering informed decisions and actions; and, curbing climate change and adapting to its impacts.

Industrial Engineering and Management - Industrial engineers design, create, and implement better and more productive systems and processes in a wide variety of industries such as manufacturing, service, healthcare, banking, and entertainment. Industrial engineers are responsible for developing and maintaining integrated engineering systems that include people, machines, material, information, and energy. Industrial engineers often are responsible for several functions such as supply-chain management, project management, facilities design, quality and reliability improvement, and healthcare management. They use system integration theory, lean manufacturing, and six sigma concepts to manage organizational operations. Whether it's streamlining an operating room, managing a worldwide supply chain, manufacturing automobiles, or solving quality and reliability problems, industrial engineers play critical roles in these functions.

Manufacturing Engineering - Manufacturing engineers play a critical role in designing and manufacturing products right from conceptual design to final product launched in the market. Manufacturing engineers use problem-solving tools and techniques to streamline the production process for making high-quality products at a lower cost. They are key team members in the production of a wide range of products including: automobiles, airplanes, agricultural equipment, electronics, surgical instruments, toys, building products, food products, and sports and recreational equipment. In all cases, manufacturing engineers design the processes and systems to make high-quality products with the required functionality with low environmental impact, so that the products are available when and where customers prefer at the best possible price.

Mechanical Engineering - Mechanical engineers research, develop and design machinery, vehicles, engines, devices and systems that function safely and reliably. From huge turbines and internal combustion engines to miniature robots, mechanical engineers are involved in their design and manufacture. Mechanical engineers also design technology for heating, ventilating and refrigeration systems; develop and characterize advanced materials; optimize the aerodynamic performance of systems; design and test biomedical devices and implants; and develop automated material handling systems. Mechanical engineers also design the tools that other fields of engineering need to perform their work. Mechanical engineers often work for consulting firms, manufacturing firms, energy companies, and various government agencies.

Advising

The College of Engineering provides advisement to students interested in the general field of engineering, but who have not yet declared a specific discipline. Students who are not ready to declare a specific engineering major are placed in pre-industrial engineering and management (IEM). This designation of pre-IEM does not mean students are enrolled in industrial engineering and management as a major field of study. Rather, it is intended for initial placement into the College of Engineering.

Undecided engineering students are encouraged to enroll in the Introduction to Engineering course (ENGR 111) to learn about the different engineering programs offered at NDSU. Students should meet with their advisors, instructors, and student groups to discuss career interests and ask questions pertaining to field of study options. Engineering students are encouraged to attend the meetings of student-run engineering clubs and organizations where they will interact with other students, alumni and professionals from various engineering disciplines. Many of these clubs and organizations participate in yearly competitions with students from other engineering programs from across the country.

Every September, the NDSU Career and Advising Center hosts the Engineering & Tech Expo. This event draws engineering companies from around the country to NDSU with the purpose of recruiting students for internships and full-time positions. By attending the event, engineering students engage with potential future employers and are provided the opportunity to gain further information on career possibilities in the engineering field.

Recommended Preparation

Engineering programs encourage high school preparation in addition to the minimum core curriculum requirements. Prospective majors in engineering should present four units of high school mathematics including two units of algebra, one unit of geometry, and one-half unit of trigonometry. Science courses should include one unit of physics and one unit of chemistry. Students whose high school credentials or entrance examinations show deficiencies in these subjects will be required to enroll in courses designed to remove such deficiencies and cannot expect to complete a program of study in the number of semesters indicated in the printed curricula.

General Engineering Plan of Study

Please note this is a sample plan of study and not an official curriculum. Actual student schedules for each semester will vary depending on start year, education goals, applicable transfer credit, and course availability. Students are encouraged to work with their academic advisor on a regular basis to review degree progress and customize an individual plan of study.

Freshman			
Fall	**Credits**	**Spring**	**Credits**
CHEM 121 General Chemistry I	3	CHEM 122 General Chemistry II	3
CHEM 121L General Chemistry I Lab	1	CHEM 122L General Chemistry II Lab	1
ENGL 110 College Composition I	4	ENGL 120 College Composition II	3
ENGR 111 Introduction to Engineering*	1	MATH 166 Calculus II**	4
MATH 165 Calculus I**	4	ME 221 Engineering Mechanics I	3
Gen Ed Wellness	2	Gen Ed Humanities & Fine Arts/Gen Ed Social & Behavioral Sciences	3
	15		**17**

*Many departments have an introduction course taken during the freshman year.

**Students who are not prepared for MATH 165 - Calculus I or MATH 166 - Calculus II may need to take MATH 103 - College Algebra and/or MATH 105 - Trigonometry, depending on their NDSU math placement exam results or transfer course work.

View NDSU equivalencies of transfer courses at: www.ndsu.edu/transfer/equivalencies

For Further Information

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