

Manufacturing



Envision

Is your future in Manufacturing?

If so, the North Dakota University System has many options just for you. While North Dakota is certainly known for agriculture and energy, manufacturing has had a strong presence in the state for many years. Considering the wide open spaces are great for large manufacturing facilities like Bobcat Doosan, Baker Boy, Trail King Industries and WCCO Belting, it makes perfect sense. Through the years, the state's manufacturing sector has benefitted from a strong workforce with a strong work ethic. While that hasn't changed, manufacturing's needs have. The rise in high-tech applications has manufacturers looking for people with both hands-on capabilities and those who are tech savvy. At NDUS institutions, we're aiming to fill that need.

Manufacturing & Higher Education

Manufacturing has been one of the backbone industries of the American economy for generations. Across the country, the industry has a history of employing people at all levels of education.

In recent years, as technological breakthroughs and policy changes have altered the economic landscape, manufacturers have aimed to keep up – and stand ahead.

Traditionally, that's meant hiring from a large swath of the workforce who was good with their hands and enjoyed seeing the fruits of their labor come off the assembly line.

Today, technology has changed that process. No matter what manufacturers might do, whether that's engaging in the mechanical, physical or chemical transformation of raw materials into finished parts or new products, what employers are looking for is a worker who knows how to turn a wrench just as easily as they can turn a page.

While entry-level positions still exist within manufacturing where job opportunities may be sought by high school graduates, more and more positions are combining the technical skills of someone familiar with machines and the softer skills

of someone used to working with and managing people.

Through the Envision 2030 process, higher education in North Dakota was able to come more in line with the needs of modern manufacturers, thanks to feedback by many business owners in the state.

Shop classes of old have transformed into modern-day instruction in vocational training at high schools or through programming made accessible by the Career and Technical Education Center.

With that solid foundation in place, already training tomorrow's manufacturers, North Dakota's manufacturers are looking forward to increased levels of participation from our colleges and universities.

Manufacturing continues to be a major industry throughout the U.S., and the number of jobs represented is increasing all the time even as those jobs are changing from what they used to look like. In our state alone, nearly 26,000 jobs exist in the industry.

More and more, those jobs require a particular mix of people who know how to work with their

hands, are comfortable around the types of technology that are rapidly changing our economy, and have strong communications and interpersonal skills.

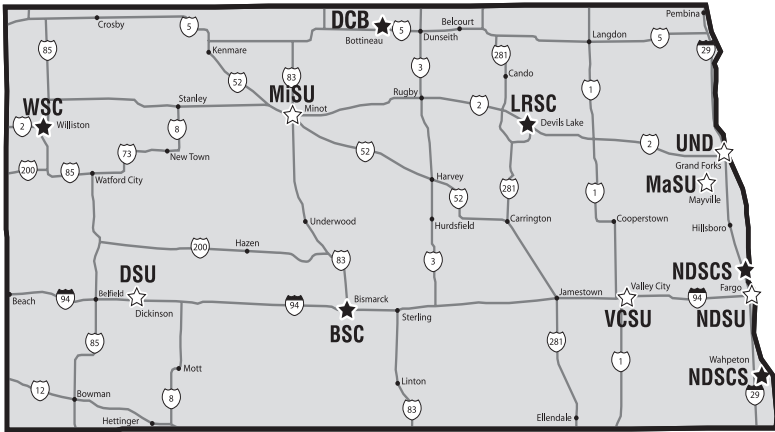
All of these are types of things that can be picked up through courses and programs at many of our colleges and universities – whether they’re traditional two-year schools like Bismarck State College or North Dakota State College of Science, or four-year schools like Dickinson State University or University of North Dakota.

For students looking to find a steady job in North Dakota, they’ll be able to utilize their hands-on training right after graduation.

While the Envision 2030 initiative looks into the future, manufacturers in the state have soundly noted the need for good employees now, ones trained here who have a love for this state and the good work ethic that comes with it.

We’re looking forward to 2030, but we’re also looking forward to meeting the demands of the present, and the great future employees who are now taking shop classes and thinking about where exactly their hands-on skills could take them.

It could take them here. It could take them home, as a future manufacturer in North Dakota.



Key: ★ = Two-Year Colleges

☆ = Four-Year Universities

- Bismarck State College (BSC)
- Dakota College at Bottineau (DCB)
- Lake Region State College (LRSC)
- North Dakota State College of Science (NDSCS)
- Williston State College (WSC)

- Dickinson State University (DSU)
- Mayville State University (MaSU)
- Minot State University (MiSU)
- North Dakota State University (NDSU)
- University of North Dakota (UND)
- Valley City State University (VCSU)

Why Envision?

Envision 2030 set out in 2016 to learn what our university system needed to do to make sure our graduates were getting the educations they desired for themselves and that were required to become successful in their fields. Ten Advisory Teams were created. The Manufacturing-focused team, made up of experts from around the state who know the business aspects inside-and-out, made detailed findings.

The team noted that manufacturing continues to undergo rapid change thanks to things like rapid automation of some of the basic, repetitive tasks that had typically been considered great for those coming right out of high school. Now, technology has come so far that manufacturers have had to think about what skills they need for hiring their long-term employees.

Numerous workforce studies have found that the jobs available today and tomorrow will require some type of post-secondary credentialing. What's that mean? Basically, it means that most jobs will require workers to have some type of industry-related credentials or certificates, if not degrees. In North Dakota, a recent study found that across all the different industries in the state, employers still valued workers who had the technical know-how and ability to work with their hands, but also needed those workers to have strong communications and critical thinking skills. While in the past it may have seemed counterintuitive, that means that today's graduates looking toward the manufacturing field not only have a good manufacturing-based education, but also some background in Liberal Arts & Humanities.

The university system is working diligently to ensure that all are programs are valuable, accessible and responsive to student needs, but also reflective of what they're going to need once they get into the workforce. To do so, our colleges and universities across the state partner with business and industry at varying levels to make sure that our programs - from certificates to graduate degrees - are precisely what our students value and what our workforce needs.

To do that, multiple pathways exist. With support from business and industry the university system aims to help students better understand how their education is integrated into future career options, and what skills and credentials they need to pursue careers in manufacturing and other trades. The system will continue to foster understanding of how specific coursework is applied in real-world scenarios builds on the achievement of the students, encouraging a deeper engagement and commitment to a future-focused perspective. That means both through the practical application of science

and knowledge, and ensuring courses are as relevant as possible for students and workforce.

Finally, Envision 2030 and its Manufacturing focus aims to ensure a continued spirit of collaboration among our colleges and universities - where many transfer options and shared programs already exist.

Finding the right fit for you

Eleven possible colleges and universities to choose from may seem like a big decision. It's likely that you may already be settling on a few top choices - either in institutions or the programs that you want to go into. But, if you're having trouble deciding, here's some more information.

The 11 academic institutions are split up into two-year colleges and four-year universities, each with a unique mission and character. You can learn

more about each individual school at NDChoose.com/colleges/.

Why so many options? It takes a diverse set of campuses, programs and instructors to deliver to our huge agricultural need.

But in any field there's always room for growth. In the following pages we'll show you how that is happening, right here, right now.

ENVISION

Instrumentation and Control at Bismarck State

Bismarck State
College's on-
campus and online
Instrumentation &
Control program
provides the student
with the basic
knowledge needed
for an entry level position as an instrument technician.



The program combines theory and hands-on training with state-of-the-art instruments, working processes and computerized control systems. Students learn to install, test, calibrate and maintain instruments that measure, indicate and control variables such as pressure, flow, level, density, temperature, force, vibration and chemical composition.

Students apply math concepts, physics concepts and industry standards to realistic situations encountered on the job. Additional instruction includes updating system documentation and building or modifying specialized systems to solve problems in measurement and control.

A limited number of students will be accepted into both the online and on-campus program in August. New students begin their first semester of technical courses in the fall semester. Refer to the how to apply section of this website for information on how to apply for admission, placement requirements and instructions on how to complete your admission file as a degree seeking student. An interview is required prior to acceptance into the program (online only).

Credits from this program may be applied to BSC's Bachelor of Applied Science degree (BAS) in Energy Management, offered entirely online. The BAS is designed for individuals interested in supervisory and management positions in the energy industry. The BAS builds on the foundation laid in an AAS degree and includes general education classes, core management courses, and energy specific management courses.

Manufacturing Engineering in the east and the west

For those interested in these types of jobs, there are options throughout the system, as can be seen at our most western and eastern universities, Dickinson State University and North Dakota State University. At each exists a program to train tomorrow's Manufacturing Engineers.

DSU and NDSU have a collaborative agreement that gives students the opportunity to begin their study towards a Bachelor of Science Degree in Engineering at DSU. That includes four engineering focuses like Manufacturing. Students can complete the first two years of courses, including introductory engineering course, at DSU. This will prepare them for transfer to NDSU where they can complete the NDSU Bachelor of Science degree requirements in either computer, electrical, industrial or manufacturing engineering.



At NDSU, the options continue at the Department of Industrial and Manufacturing Engineering. The department offers high quality undergraduate and graduate programs through innovative teaching, imaginative research and scholarship. There, students can take one of two programs of study: Industrial Engineering & Management and Manufacturing Engineering.

Industrial Engineering concentrates on designing, installing, and improving procedures and systems for effective and efficient operation of enterprises in healthcare, financial, transportation, distribution and other types of service industries; governmental units and agencies. Manufacturing engineering involves 1) designing processes to make high-quality, functional and economical products; 2) developing facilities for efficient production systems; and 3) utilizing advanced technologies such as laser machining, welding, robotics and micro-manufacturing.

Ample opportunities at North Dakota State College of Science

It's unlikely that manufacturing is represented better anywhere throughout the university system than North Dakota State College of Science. The small college has a big focus on manufacturing, and a history of producing some of the most talented workers in the state's manufacturing industry. That's thanks to the multiple programs they offer.

The **Industrial Electrical** option adds skills in the area of automated industrial controls (robotics, pneumatics and digital electronics) as well as large motors and the electronic drives that control those motors.

This option of the Electrical Technology program is designed to give students the skills necessary for successful employment in the industrial sector of the electrical industry. The core curriculum of the Electrical Technology programs includes in-depth study of electrical theory, applied math, code study and residential wiring. A substantial amount of hands-on experience is provided in our seven dedicated laboratories, which contain AutoCAD drawing, advanced electrical test equipment, electric motors, magnetic motor starters, programmable controllers, electronic devices and instrumentation. Green technology is applied in areas of lighting and design class, efficiency of motors, controlling of loads in building operation through programmable controllers.

The Industrial Electrical option adds skills in the area of automated industrial controls (robotics, pneumatics and digital electronics) as well as large motors and the electronic drives that control those motors. Graduates of this option find employment as maintenance technicians for manufacturing firms,

The **Technical Studies – Journeyworker Track** program is designed to allow advanced standing to individuals who have completed an apprenticeship training program of at least 6,000 hours. It is a flexible program providing students the opportunity to earn an Associate in Applied Science degree by combining their previous apprenticeship training with college credit course work. Students will work with an advisor to design their own plan of study based on their personal career goals.

The **Precision Machining Technology** program provides students experience in machining as it pertains to machining, toolmaking and mold making. This program provides education and training in CNC programming, CNC set-up and operation, production machining, mold making, die making, toolmaking, automated manufacturing, human relations, communications and other aspects of general education. Career opportunities offer a wide range of employment possibilities in the manufacturing, machining, toolmaking, mold making and production areas. Recent placement has been 98 percent.

The **Robotics, Automation and Mechatronics Technology** program combines instruction in electronics, networking, computers, mechanics, and fluid power utilized in manufacturing and production facilities. The program trains students to be prepared for the dynamic field of mechatronics, the combination of disciplines used in manufacturing and production facilities such as: Electronics networking; Automated manufacturing; Computer systems; Mechanics; and Fluid power.

Mechatronics technicians will troubleshoot, repair, install and program automated manufacturing systems. Some of the industries that employ people with these skill sets are manufacturing, pharmaceutical, food, energy, defense and agriculture.

Technical Studies allows individuals to combine elements of various disciplines in a meaningful and logical sequence that meets their career goals. For example, a Technical Studies program may be appropriate if a student wanted to combine certain elements of a Business Management curriculum with parts of a Information and Communications Technology program. Another illustration of a Technical Studies program might include a program of study that consists of parts of Electrical Technology, HVAC/R Technology and Plumbing.

The **Welding Technology** program provides education and training in advanced welding and cutting processes, robotics, computer numerical control operations, inspection, print reading, fabrication, pipe and plate welding, math, communications and other aspects of general education. The Welding certificate option provides students experience in welding as it pertains to assembly, manufacturing, energy and construction.



UND's Manufacturing Engineering

University of North Dakota's Mechanical Engineering Department prepares students at all levels to effectively apply modern engineering principles to the evolving needs of industry and society through focused efforts in manufacturing, materials science, mechanical design, thermal sciences, and aerospace applications.

The department supports an accessible, collaborative, multidisciplinary research and learning environment that stimulates faculty and students to reach their highest potential through hands-on education, leadership opportunities, and life-long learning.

The department is committed to providing each of our students with an outstanding education that serves as a foundation for future professional success. Many classes include hands-on laboratory learning exercises in which students get to actively participate. Some of the many projects our students are working on include wind tunnel experiments, space hardware design, nanotechnology development, pressure vessel research, coal combustion, agricultural innovations, and precision machining.

Mechanical engineering is one of the most versatile of all the engineering disciplines. Graduates of the program work in power, aircraft, automotive, and defense industries throughout the U.S., while many choose to work locally with companies such as Arctic Cat, Polaris, Marvin Windows, and Goodrich Corporation.

Nearly all of our students receive job offers before they graduate or elect to continue in graduate education at UND and other fine engineering schools. Cooperative education opportunities and summer internships are also available to you during your academic career at UND.



NDSCS gets NSF grant

North Dakota State College of Science has been awarded a \$742,567 grant from the National Science Foundation to support the North Dakota Welds (NDWelds) Program: Advancing Welding Technician Skills for Students and Training for Educators.

NDWelds has a goal of enhancing welding technician skills for secondary school students, two-year college students, secondary school teachers and two-year college faculty members. Through this project, NDSCS will increase the number of trained and certified welders possessing essential and advanced skills to meet the workforce needs of the region.

The NDWelds project will increase awareness among students from under-represented groups of the opportunity for careers in welding. NDWelds significantly impacts the regional economic environment by filling a critical employment training need.

The grant award started on May 15, 2017, and will end on April 30, 2020.

NDSCS students excel at North Dakota SkillsUSA Contest

Students from the North Dakota State College of Science received a number of awards at the North Dakota SkillsUSA State Leadership and Skills Conference, which was held in Bismarck this past year. By achieving gold medals at the state level, 14 of these students qualified to compete in their respective categories at the national SkillsUSA Championships, which will be held in Louisville, Ky. in June.

Technology, Electrical Technology, Automotive Technology, Precision Machining Technology, and Diesel Technology.



More than 30 students from NDSCS represented their skills from such manufacturing-related programs as Powersports Technology, Welding

NDSCS receives nearly \$1M welding grant

Story and photo by Frank Stanko, Wahpeton Daily News. Originally published June 12, 2017. Reprinted with permission.

The next three years are looking prosperous for North Dakota State College of Science.

Recently, the 104-year-old institution received a National Science Foundation grant worth nearly three quarters of a million dollars. The grant, totaling \$742,567, will be used through April 30, 2020 to benefit NDSCS' North Dakota Welds program.

"I'm proud of our welding program, because it's always been goal-oriented," said Clint Gilbertson, who will oversee the program while also serving as an associate professor. "A lot of times, departments will go after grant funds just because there's money there.

"Our long-range goals have always been focused, whether it's looking at five years or 10. If a grant opportunity comes up and it doesn't align with our goals, we put it aside. A lot of our success is because of our focus. When you're focused, you have a buy-in from the entire department, faculty and students, helping things go very well," he added.

According to Gilbertson, most of NDSCS' welding faculty will be involved in putting the grant to use. His key team includes associate professors Joel Johnson, Lee Larson and Vance Harshen, plus instructors Mitch Van Vleet and Chance Pausch.

"There is a budget lined up for three years. It's basically the full amount divided by three. But there is flexibility within the grant, for things like if I needed more equipment," Gilbertson explained.

With class registrations still occurring, Gilbertson is unsure how many students will take NDSCS' welding program this fall. Currently, there is the potential for 100 students (60 first-year students, 40 second-year students) between the Fargo and Wahpeton campuses.

According to Gilbertson's grant proposal, the following five goals will be accomplished:

- Developing a welding curriculum at NDSCS in alignment with the curriculum developed in career and technical education courses in secondary schools across North Dakota and the adoption of the American Welding Society’s (AWS) “Schools Excelling through National Skill Standards Education (SENSE) program
- Conducting outreach activities targeting female and minority students to increase enrollments in secondary career and technical education courses
- Recruiting and training education instructors through professional development activities
- Facilitating the certification and testing of welders using national standards by NDSCS becoming an AWS-accredited test facility
- Developing latticed curricula to establish new degree tracts in advanced skills for welding and manufacturing students at NDSCS while increasing the number of NDSCS graduates that participate in “2 Plus 2” programs with Minnesota State University-Moorhead and Valley City State University

“We’re going to train all the high school welding instructors across the state of North Dakota to our standards,” Gilbertson continued. “We’re going to provide them with equipment and materials to help get their programs up to speed.”

By 2020, Gilbertson continued, it will hopefully be possible for NDSCS to see further gains with its long-range goal of helping incoming students be well-prepared and on the fast track for successful completion of its welding program.

“These efforts have the potential to transform the regional and state landscape of welding technician education in North Dakota,” he wrote.

The welding program isn’t the only NDSCS department with an optimistic future in sight. In May, NDSCS acquired the use of nearly 95 acres of farmland north of Wahpeton from the Kosel and Patterson families.

Owners Linda Patterson and her mother, Mary Kosel, worked with NDSCS’ Alumni Foundation to arrange the land usage. The women and NDSCS signed a contract on Thursday, May 11.

Over the next three years, NDSCS’ agriculture department will collaborate with agriculture students to create a “land lab” on the parcel.

Workforce training grant gives manufacturing education a boost at NDSCS

The North Dakota Department of Commerce announced a \$183,653 workforce enhancement grant for NDSCS. The grant will support NDSCS's Advanced Metrology Training Initiative. Metrology is the scientific study of measurement.

The grant will provide funding to NDSCS to purchase a variety of precision measurement instruments and incorporate national certifications into program curriculum.

“This training initiative significantly advances our ability to educate students in quality control,” said Barbara Bang, NDSCS Technologies and Services Division Dean. “They will now receive certifications in manual and highly advanced automated measuring processes.”

The following programs at NDSCS use the equipment in their curriculums:

- Precision Machining Technology
- Welding Technology
- Robotics, Automation and Mechatronics Technology
- Diesel Technology
- Powersports Technology
- Caterpillar Dealer Service Technician
- Automotive Technology.

Workforce enhancement grants enable two-year colleges to apply for funds to create or enhance training programs that address workforce needs of North Dakota's private-sector employers. Projects require a dollar-for-dollar match of state to private funds.

“Workforce enhancement grants help to increase the capacity of our higher education institutions, like NDSCS, to provide a consistent stream of qualified workers,” said Wayde Sick, workforce development director at the North Dakota Department of Commerce. “The partnership of industry, education, and state and local governments is needed to meet the developing workforce needs of North Dakota.”

Grant funding may be used for curriculum development, equipment,

recruitment, and training and certifying instructors. Funds may not be used to supplant funding for current operations.

The Workforce Enhancement Council reviews all proposals and provides funding recommendations to the commissioner of the North Dakota Department of Commerce. The council consists of the private-sector membership of the North Dakota Workforce Development Council, the state director of the Department of Career & Technical Education, and the division director of the Workforce Development Division of the North Dakota Department of Commerce, who serves as the chair.

The North Dakota Department of Commerce works to improve the quality of life for North Dakota citizens by leading efforts to attract, retain and expand wealth. Commerce serves businesses and communities statewide through committed people and partners who offer valuable programs and dynamic services.

For more North Dakota news and information go to www.NDCommerce.com.

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For more information about any of the 11 campuses that make up the North Dakota University System, contact the college or university at:

Bismarck State College
Bismarck, ND 58506
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800.445.5073
www.bismarckstate.edu

Dakota College at Bottineau
Bottineau, ND 58318
701.228.5488
800.542.6866
www.dakotacollege.edu

Dickinson State University
Dickinson, ND 58601
701.483.2175
800.279.4295
www.dickinsonstate.edu

Lake Region State College
Devils Lake, ND 58301
701.662.1514
800.443.1313
www.lrsc.edu

Mayville State University
Mayville, ND 58257
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800.437.4104 ext. 34842
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