

# Nanoscience Technology AAS DEGREE

## Program Overview

This program prepares students for careers in nanobiotech, nanomaterials and nanoelectronics industries. The program also provides a strong foundation applicable to environmental, energy and agricultural industries. The curriculum is a combination of classroom and laboratory experiences, with hands on use of nanoscale equipment in all 4 semesters. Students have several opportunities for individual research and exploration of nanoscale concepts. Offered in partnership with the University of Minnesota, the program provides skills and knowledge required for employment in a large number of companies. The DCTC program also provides a starting point to four year degrees at multiple institutions in many degree programs. Processes of scientific inquiry, experiment and research design, critical thinking, and communication are aspects that are woven into each course.

## Career Opportunities

Nanoscience technologists work in multiple business environments including research, production, testing, training and marketing. Often this role is a bridge between scientists, engineers and other technicians. Program graduates may work independently in some aspects but most often are part of a team. Your job will include some desk work but most of your time will be spent in a laboratory environment preparing test samples, microscope operation and testing, documentation and analysis and communication of your results. These technologists do not usually do the same thing for many months at a time. Finally, although nanoelectronics related jobs may occur in a clean room, most of these jobs are in traditional company research environments and labs. The options and work environments are varied and expanding with the United States nanotech market expected to reach \$1 trillion by 2015.

## Program Outcomes

1. Solve nanoscience technology problems within economic, environmental, social, political, ethical, and manufacturability constraints.
2. Explain the potential of nanoscience in multiple biological applications including nanopore, nanoparticle and nanochannel structures, diagnostics and treatment.
3. Relate nanoscale principles to imprint lithography, etching, nanotransistors, quantum computing, magnetic and electron spin memory, and holographic memory devices.
4. Fabricate structures such as nanowires, cantilevers and nanochannels.
5. Create nanomaterials, particles and crystals by various processes including colloidal suspensions, deposition, evaporation and plating

## Program Faculty

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 Deb Newberry                      deb.newberry@dctc.edu

## Program Start Dates

Fall, Spring, Summer

## Program Requirements

Check off when completed

Course	Cr
<input type="checkbox"/> NANO 1100 Fundamentals of Nanotechnology 1	.3
<input type="checkbox"/> NANO 1110 Student Lab Experience and Research	.3
<input type="checkbox"/> NANO 1200 Fundamentals of Nanotechnology 2	.3
<input type="checkbox"/> NANO 1210 Computer Simulation	.1
<input type="checkbox"/> NANO 2101 Nanoelectronics	.3
<input type="checkbox"/> NANO 2111 Nanobiotechnology/Agriculture	.3
<input type="checkbox"/> NANO 2121 Nanomaterials	.3
<input type="checkbox"/> NANO 2131 Manufacturing Quality Assurance	.2
<input type="checkbox"/> NANO 2140 Interdisciplinary Lab	.3
<input type="checkbox"/> NANO 2151 Career Planning and Industry Tours	.1
<input type="checkbox"/> NANO 2970 Industry Internship	.1
<b>Subtotal</b>	<b>26</b>

## Second Year – Second Semester

At the University of Minnesota

<input type="checkbox"/> MT 3111 Elements of Micro Manufacturing	.3
<input type="checkbox"/> MT 3112 Elements of Micro & Nano Man Lab	.1
<input type="checkbox"/> MT 3121 Thin Films Deposition	.3
<input type="checkbox"/> MT 3131 Introduction to Materials Characterization	.3
<input type="checkbox"/> MT 3132 Materials Characterization Lab	.1
<input type="checkbox"/> MT 3141 Prin & Apps of Bionanotech	.3
<input type="checkbox"/> MT 3142 Nanoparticles & Biotech Lab	.1
<b>Subtotal</b>	<b>15</b>

## General Education/MnTC Requirements

General Education/MnTC Requirements	Cr
Refer to the Minnesota Transfer Curriculum Course List for each Goal Area	
<input type="checkbox"/> Goal 1: Communication	.7
ENGL 1711 Composition 1 – 4 cr	
SPCH 1720 Interpersonal Communications – 3 cr	
<input type="checkbox"/> Goal 3: Natural Sciences	.17
BIOL 1740 General Biology 1 – 5 cr	
CHEM 1700 Chemistry Concepts – 4 cr	
PHYS 1720 Principles of Physics 1 – 4 cr	
PHYS 1722 Principles of Physics 2 – 4 cr	
<input type="checkbox"/> Goal 4: Mathematics/Logical Reasoning	.7
MATH 1730 College Algebra – 3 cr	
MATH 1740 Introduction to Statistics – 4 cr	
<b>General Education Requirements</b>	<b>31</b>

## Total Program Credits

**72**

NANO courses may be offered at Saint Paul College or Dakota County Technical College

## Transfer Opportunities

Saint Paul College has a transfer articulation agreement between the following program and post-secondary institution for the baccalaureate degree program listed below. For more information please go to [www.saintpaul.edu/Transfer](http://www.saintpaul.edu/Transfer).

## Nanoscience Technology AAS

BA Individualized Studies  
 Metropolitan State University

## Course Sequence

This course sequence is recommended for a full-time student; however, this sequence is not required.

Not all courses are offered each semester; a selection of courses is offered summer term. Students should consult with the Program Faculty each semester.

### First Semester

NANO 1100 Fundamentals of Nanotechnology 1	.3
Goal 1: ENGL 1711 Composition 1	.4
Goal 3: PHYS 1720 Principles of Physics 1	.4
Goal 3: BIOL 1740 General Biology 1	.5
Goal 4: MATH 1730 College Algebra	.3
<b>Total Semester Credits</b>	<b>19</b>

### Second Semester

NANO 1110 Student Lab Experience and Research	.3
NANO 1200 Fundamentals of Nanotechnology 2	.3
NANO 1210 Computer Simulation	.1
Goal 1: SPCH 1720 Interpersonal Communication	.3
Goal 3: CHEM 1700 Chemistry Concepts	.4
Goal 3: PHYS 1722 Principles of Physics 2	.4
Goal 4: MATH 1740 Introduction to Statistics	.4
<b>Total Semester Credits</b>	<b>22</b>

### Third Semester

NANO 2101 Nanoelectronics	.3
NANO 2111 Nanobiotechnology/Agriculture	.3
NANO 2121 Nanomaterials	.3
NANO 2131 Manufacturing Quality Assurance	.2
NANO 2140 Interdisciplinary Lab	.3
NANO 2151 Career Planning and Industry Tours	.1
<b>Total Semester Credits</b>	<b>15</b>

### Fourth Semester – At the University of Minn.

MT 3111 Elements of Microelectronic Manufacturing	.3
MT 3112 Elements of Micro & Nano Manufacturing Lab 1	.1
MT 3121 Thin Films Deposition	.3
MT 3131 Introduction to Materials Characterization	.3
MT 3132 Materials Characterization Lab	.1
MT 3141 Principles & Applications of Bionanotech	.3
MT 3142 Nanoparticles & Biotech Lab	.1
NANO 2970 Industry Internship & Observation	.1
<b>Total Semester Credits</b>	<b>16</b>

## Total Program Credits

**72**

## Minimum Program Entry Requirements

Students entering this program must meet the following minimum program entry requirements:

**Reading:** Score of 78+ or grade of "C" or better in READ 0722

**Writing:** Score of 78+ on Reading Comprehension or grade of "C" or better in ENGL 0922

**College Level Mathematics:** Score of 50+ or grade of "C" or better in MATH 0920

**Assessment Results and Prerequisites:** Students admitted into Saint Paul College programs may need to complete additional courses based on assessment results and course prerequisite requirements. Certain courses in the program have additional prerequisites.

380A

Information is subject to change.  
 This Program Requirements Guide is not a contract.