STEM: Science, Technology, Engineering, Mathematics
Programs & Courses

Science, Mathematics

Science

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<td>Chemistry</td>
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Mathematics

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Science, Technology, Engineering

Science

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<td>Chemistry Transfer Pathway AS (60 Credits)</td>
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<td>Science and Engineering Technology AS Degree</td>
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Engineering

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<td>(60 Credits)</td>
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<tr>
<td>Visualization Technology AAS Degree</td>
<td>201-202</td>
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<td>(60 Credits)</td>
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<tr>
<td>Visualization Technology Certificate</td>
<td>203</td>
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<td>(21 Credits)</td>
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<td>Computer Animation Certificate (18 Credits)</td>
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<td>Web Design Certificate (18 Credits)</td>
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Computer Science

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<td>CyberSecurity AAS Degree (60 Credits)</td>
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<td>CyberSecurity Certificate (24 Credits)</td>
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<td>Computer Science Transfer Pathway AS Degree</td>
<td>209-210</td>
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<tr>
<td>(60 Credits)</td>
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<td>Management Information Systems AS Degree</td>
<td>211-212</td>
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<td>Computer Network Engineering AAS Degree</td>
<td>213-214</td>
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<tr>
<td>Computer Programming AAS Degree</td>
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<td>(60 Credits)</td>
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<td>Network Administration Certificate</td>
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<td>(24 Credits)</td>
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<tr>
<td>Java Programming Certificate (24 Credits)</td>
<td>219-220</td>
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<td>Web Based 2D Game Development Certificate</td>
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<td>(24 Credits)</td>
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<tr>
<td>Web Development Certificate (24 Credits)</td>
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Data Science

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<tbody>
<tr>
<td>Data Science AS Degree (60 Credits)</td>
<td>225</td>
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<tr>
<td>Geographic Information Science AAS Degree</td>
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<td>(60 Credits)</td>
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<tr>
<td>Geographic Information Science Certificate</td>
<td>227</td>
</tr>
<tr>
<td>(24 Credits)</td>
<td></td>
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</tbody>
</table>
Science

Biochemistry

Biochemistry is the study of the chemical reactions in living organisms, and it contains aspects of organic and inorganic chemistry as well as biology. Topics covered in biochemistry include protein structure and function, as well as cell metabolic processes that include lipids, carbohydrates, proteins, and nucleic acids. Biochemistry includes fundamental concepts that can be applied to molecular biology, immunchemistry, neurochemistry, and biophysical chemistry. It has a wide range of applications which can be applied to fields such as medicine, agriculture, toxicology, and engineering to name a few. Biochemists often work in modern research laboratories and participate in stimulating, creative work. They interact with scientists from other fields because their research is intertwined. The application of biochemistry to other fields focuses on improving the quality of life. Opportunities for employment in this field are expected to grow in industry, medicine, and genetic research.

<table>
<thead>
<tr>
<th>Course</th>
<th>Cr</th>
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<tbody>
<tr>
<td>BIOC 1790</td>
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<td>1-4</td>
</tr>
<tr>
<td>BIOL 2790</td>
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</tr>
</tbody>
</table>

Biology

The Biology department provides high quality educational experiences in the biological sciences including: environmental science, general biology for majors and non-majors, nutrition, medical terminology, forensic science, biology of women, human anatomy and physiology for majors and non-majors, and microbiology. The faculty believe biology occupies a central position in the physical sciences and that an understanding of fundamental biological principles enables students to make better-informed decisions for work and life roles. The biology faculty promote active learning in lecture and lab activities, interacting closely with students at various levels of academic development. Biology courses serve the College and students by providing offerings that satisfy requirements for general education, allied health and pre-professional transfer programs. Biology faculty are committed to excellence in teaching and scholarship providing a variety of lab/field experiences and online applications.

<table>
<thead>
<tr>
<th>Course</th>
<th>Cr</th>
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<tr>
<td>BIOL 1471</td>
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<td>BIOL 1785</td>
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<td>BIOL 2721</td>
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<td>BIOL 2722</td>
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<td>BIOL 2755</td>
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<tr>
<td>BIOL 2760</td>
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</tr>
<tr>
<td>BIOL 2770</td>
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</tr>
</tbody>
</table>
Chemistry

The Chemistry department offers courses that provide an understanding of chemical principles across the discipline. The chemistry faculty believe that an understanding of fundamental chemical principles enables students to make better-informed decisions on a wide variety of issues related to work and life roles. The faculty interact closely with students, a diverse population at various levels of academic development, to help them develop capabilities in science and become lifelong learners. Chemistry courses fulfill requirements for general education and various graduation requirements.

Course | Cr
--- | ---
CHEM 1700 Chemistry Concepts | 4
CHEM 1711 Principles of Chemistry 1 | 4
CHEM 1712 Principles of Chemistry 2 | 4
CHEM 2720 Organic Chemistry 1 | 5
CHEM 2721 Organic Chemistry 2 | 5
CHEM 2730 Instrumental Analysis | 4
CHEM 2790 Research Project for Science and Engineering Technology | 1-4
CHEM 2791 Cleanroom Lab Research Project | 1-4
CHEM 2795 Special Topics in Chemistry | 1-6

Natural Sciences

The Natural Sciences department offers courses in the areas of earth science, geology, oceanography, and meteorology. Natural Science courses fulfill Goals 3, 9 & 10 of the Minnesota Transfer Curriculum, as well as various graduation requirements.

Course | Cr
--- | ---
NSCI 1710 Earth Science | 4
NSCI 1721 Introduction to Geology | 4
NSCI 1730 Introduction to Oceanography | 3
NSCI 1740 Introduction to Meteorology | 3
NSCI 1750 Natural Disasters | 3
NSCI 1770 Introduction to Energy and the Environment | 3
NSCI 1780 Contemporary Issues in Science | 3
NSCI 1782 Minnesota Geology | 3
NSCI 1790 Special Topics in Natural Science | 1-6
NSCI 2770 Natural Sciences Internship | 1-4

Physics

The study of Physics involves the study of matter and motion, energy and forces. The Physics department offers Principles of Physics 1 and 2 as well as General Physics 1 and 2 with a calculus base. Students enroll in physics courses to fulfill the Minnesota Transfer Curriculum requirements and various graduation requirements.

Course | Cr
--- | ---
PHYS 1720 Principles of Physics 1 | 4
PHYS 1722 Principles of Physics 2 | 4
PHYS 1760 Descriptive Astronomy (no lab) | 3
PHYS 2700 General Physics 1 (with Calculus) | 5
PHYS 2710 General Physics 2 (with Calculus) | 5
PHYS 2760 Introductory Astronomy (with lab) | 4
PHYS 2790 Special Topics in Physics | 1-6

Mathematics

The study of mathematics provides foundational knowledge for understanding other disciplines, as well as logical reasoning and problem solving skills for work and life roles. The department offers a full curriculum to meet the educational needs of our students such as developmental offerings, mathematics courses specific to majors and a range of general education courses including Statistics, College Algebra, Calculus, and Ordinary Differential Equations. Courses fulfill Minnesota Transfer Curriculum requirements and graduation requirements.

Course | Cr
--- | ---
MATH 0910* Introductory Algebra | 3
MATH 0920* Intermediate Algebra | 3
MATH 1411* Applied Mathematics | 3
MATH 1420* Trade Algebra and Trigonometry | 3
MATH 1710 Liberal Arts Mathematics | 3
MATH 1730 College Algebra | 3
MATH 1740 Introduction to Statistics | 4
MATH 1750 Trigonometry | 3
MATH 1762 Pre-Calculus | 5
MATH 1790 Special Topics in Mathematics | 1-6
MATH 2100 Intermediate Statistics | 4
MATH 2460 Discrete Mathematics | 4
MATH 2749 Calculus 1 | 4
MATH 2750 Calculus 2 | 4
MATH 2753 Multivariable Calculus | 4
MATH 2760 Differential Equations and Linear Algebra | 4

* Does not meet Minnesota Transfer Curriculum (MnTC) Distribution Requirements
Program Overview
The Biology Transfer Pathway AS degree is awarded for successful completion of 60 credits in science and liberal arts. It is designed to constitute the first two years of a bachelor’s degree in Biology.

Career Opportunities
A biology major is a good choice for students who are intrigued by living things. Upon completion of the Biology Transfer Pathway AS degree, students will have learned to apply the scientific method, set up experiments, and use laboratory equipment. Students will develop laboratory skills, techniques, and procedures allowing them to gather, organize, and analyze data. As graduates in Biology, students can choose a number of career options from technical scientific laboratory careers to education. Salaries will vary depending on the chosen career path.

Program Outcomes
1. Implement scientific processes through experimentation, data analysis, and the use of common tools in a biology laboratory (i.e. microscope, spectrophotometer, electrophoresis).
2. Communicate scientific findings through the use of appropriate technology.
3. Describe major biological concepts and various biological systems and their interactions.
4. Apply biological concepts to contemporary issues using scientific literature and appropriate knowledge from other disciplines.
5. Collaborate with others on designing, conducting, and evaluating projects.

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Program Requirements
☐ Check off when completed

Course | Cr
-------|--------
BIOL 1740 General Biology 1 | 5
BIOL 1745 General Biology 2 | 5
BIOL 2755 Genetics | 4
CHEM 1711 Principles of Chemistry 1 | 4
CHEM 1712 Principles of Chemistry 2 | 4
Program Electives (select 1 of the following) | 4
BIOL 2750 General Microbiology – 4 cr
These courses can be taken at partner institutions
BIOL 17XX Cell and Molecular Biology – 5 cr
BIOL 17XX General Ecology – 5 cr
Century College
Inver Hills Community College
Minneapolis Community & Technical College
Normandale Community College
Subtotal | 26

General Education/MnTC Requirements | Cr
Goal 1: Communication | 9
ENGL 1711 Composition 1 – 4 cr
ENGL 1712 Composition 2 – 2 cr
COMM 17XX – 3 cr
Goal 4: Mathematical/Logical Reasoning | 7
MATH 1730 College Algebra (or higher) – 3 cr
Goal 5: History, Social Science and Behavioral Sciences | 3
Goal 6: Humanities and Fine Arts | 3
Goals 1-10 of the Minnesota Transfer Curriculum | 12
Select a minimum of 11-12 additional credits
General Education Requirements | 34

Total Program Credits | 60

Minimum Program Entry Requirements
Students entering this program must meet the following minimum program entry requirements:

- Reading: Score of 250+ or grade of “C” or better in READ 0722
- Writing: Score of 250+ on Reading Comprehension or grade of “C” or better in ENGL 0922
- Adv. Algebra & Functions: Score of 250+ 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 MATH, READ, and ENGL courses have additional prerequisites.

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

Program Start Dates
Fall, Spring, Summer

See back of this guide for Course Sequence & Transfer Opportunities
### 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**
- Goal 1: ENGL 1711 Composition 1 ................ 4
- Goal 1: COMM 17XX .......................... 3
- Goal 3: BIOL 1740 General Biology 1 .............. 5
- Goal 4: MATH 1730 College Algebra (or higher) ..... 3

**Total Semester Credits** .................................. 15

**Second Semester**
- Goal 1: ENGL 1712 Composition 2 ................ 2
- Goal 3: BIOL 1745 General Biology 2 .............. 5
- Goal 3: CHEM 1711 Principles of Chemistry 1 ....... 4
- Goal 5: History, Social Science and Behavioral Sciences. ................................ 3

**Total Semester Credits** .................................. 14

**Third Semester**
- Goal 3: CHEM 1712 Principles of Chemistry 2 ....... 4
- Goal 3: BIOL 2755 Genetics ..................... 4
- Goal 4: MATH 17XX College Algebra (or higher) ... 3-4
- Goal 6: Humanities and Fine Arts .................. 3

**Total Semester Credits** .................................. 14-15

**Fourth Semester**
- Goals 1-10 MnTC Elective ................... 11-12
- Program Electives ............................... 4-5

**Total Semester Credits** .................................. 15-17

**Total Program Credits** ............................... 60

### 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 saintpaul.edu/Transfer.

**Biology Transfer Pathway AS**
- BS  Biology – General Biology
- BS  Biology – Ecology, Biodiversity, and Evolutionary Biology
- BS  Biology – Environmental Science
- Bemidji State University
- BA  Biology
- Metropolitan State University
- BA  Biology
- BS  Biology
- Minnesota State University, Mankato
- BA  Biology
- BA  Ecology
- Minnesota State University, Moorhead
- BA  Biology Concentration
- Southwest Minnesota State University
- BA  Biology
- St. Cloud State University
- BA  Biology
- Winona State University

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Program Requirements Guide 2020 - 2021
Chemistry Transfer Pathway  

AS DEGREE

Program Overview

The Chemistry Transfer Pathway AS degree is awarded for successful completion of 60 credits in science and liberal arts. It is designed to constitute the first two years of a bachelor's degree in Chemistry.

Career Opportunities

Chemistry majors are curious, analytical and self-starting leaders. Upon completion of the Chemistry AS degree, students will have developed strong communication skills and grown in their scientific and mathematical reasoning skills as well as developed their ability to perform experiments in a hands-on environment. As graduates in Chemistry, students can choose a number of career options from technical scientific laboratory careers to education. Salaries will vary based on the chosen career path.

Program Outcomes

1. Apply fundamentals of experimental chemistry in the laboratory environment
   CRITERIA
   a. Carefully follow written procedures
   b. Make accurate and precise measurements, perform calculations
   c. Operate instrumentation safely and properly
   d. Keep scientific records
   e. Design and execute experiments using scientific method
   f. Follow safety protocols and waste management procedures
   ASSESSMENTS
   a. Formal lab project rubric

2. Apply fundamentals of theoretical chemistry in the classroom and laboratory environment
   CRITERIA
   a. Build portfolio through projects
   a. Analyze data and derive a conclusion from collected data
   a. Present results of lab projects
   ASSESSMENTS
   a. Portfolio rubric

3. Solve chemistry related problems.
   CRITERIA
   a. Identify and analyze a chemistry problem using critical thinking
   a. Propose a problem-solving strategy and utilize it
   ASSESSMENTS
   a. Portfolio rubric

4. Communicate scientific results effectively in oral and written formats.
   CRITERIA
   a. Write clearly and concisely

5. Evaluate chemistry related issues in society using scientific literature.
   CRITERIA
   a. Perform literature search relevant to issue(s)
   a. Write a review of the issue(s)
   a. Present results of lab projects
   a. Address or answer audience questions
   a. Write clearly and loudly, and to the appropriate level of the audience
   a. Address or answer audience questions
   ASSESSMENT TOOLS
   a. Formal lab project rubric

Program Requirements

Chemistry Transfer Pathway AS
BS Chemistry
BA Individualized Studies
Metropolitan State University
BS Chemistry
Minnesota State University, Mankato (ACS Approved)
BA Chemistry
Southwest Minnesota State University
BS Chemistry
St. Cloud State University (ACS Approved)
BS Chemistry
Minnesota State University, Moorhead
BS Chemistry
Winona State University

Program Faculty

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Penny Starkey  
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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 MATH, READ, and ENGL courses have additional prerequisites.

Program Requirements

☐ Check off when completed

Course Cr
☐ CHEM 1711 Principles of Chemistry 1 ............. 4
☐ CHEM 1712 Principles of Chemistry 2 ............. 4
☐ CHEM 2720 Organic Chemistry 1 .................. 5
☐ CHEM 2721 Organic Chemistry 2 .................. 5
☐ PHYS 2700 General Physics 1 (w/Calc) .......... 5
☐ PHYS 2710 General Physics 2 (w/Calc) .......... 5
Subtotal ........................................... 28

General Education/MnTC Requirements Cr

Refer to the Minnesota Transfer Curriculum Course List for each Goal Area
☐ Goal 1: Communication .......................... 9
   ENGL 1711 Composition 1 ........................ 4
   ENGL 1712 Composition 2 ........................ 2
   COMM 17XX ............................... 3
☐ Goal 3: Natural Science .......................... 0
   Met with courses from above.
☐ Goal 4: Mathematical/Logical Reasoning .... 8
   MATH 2749 Calculus 1 .......................... 4
   MATH 2750 Calculus 2 .......................... 4
☐ Goal 5: History, Social Science, and Behavioral Sciences .......................... 3
☐ Goal 6: Humanities & Fine Arts ................ 3
☐ Goals 1-10 of the MnTC .......................... 9

Students must select a minimum of 9 additional credits such that courses from at least six (6) goal areas of the Minnesota Transfer Curriculum are met.

General Education Requirements .................. 32

Total Program Credits ............................. 60
Chemistry Transfer Pathway AS DEGREE (continued)

Program Start Dates
Fall, Spring, Summer

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
Goal 1: ENGL 1711 Composition ................. 4
Goal 1: COMM 17XX .......................... 3
Goal 3: CHEM 1711 Principles of Chemistry 1 ....... 4
Goal 4: MATH 2749 Calculus 1 ................... 4
Total Semester Credits. .......................... 15

Second Semester
Goal 3: CHEM 1712 Principles of Chemistry 2 ....... 4
Goal 3: PHYS 2700 General Physics 1 .............. 5
Goal 5: History, Social Science, and Behavioral Sciences ........................................... 3
MnTC elective ................................ 3
Total Semester Credits. .......................... 15

Third Semester
Goal 1: ENGL 1712 Composition 2 ................ 2
Goal 3: PHYS 2710 General Physics 2 .............. 5
Goal 3: CHEM 2720 Organic Chemistry 1 .......... 5
Goal 6: Humanities & Fine Arts. ..................... 3
Total Semester Credits. .......................... 15

Fourth Semester
Goal 3: CHEM 2721 Organic Chemistry 2 .......... 5
Goal 4: MATH 2750 Calculus 2 ................... 4
MnTC elective ................................ 6
Total Semester Credits. .......................... 15

Total Program Credits ............................ 60
Program Requirements

Goal 1: ENGL 1711 Composition 1 ................ 4
Goal 3: CHEM 1711 Principles of Chemistry 1 ... 4
Goal 5: History, Social Science and Behavioral Sciences ......................... 3
Goal 6: Humanities and Fine Arts ................. 3
Total Semester Credits ................................ 16

Second Semester
Goal 1: COMM 17XX .......................... 3
Goal 3: CHEM 1712 Principles of Chemistry 2 ... 4
Goal 4: MATH 2749 Calculus 1 ................... 4
Total Semester Credits ................................ 15

Third Semester
Goal 3: CHEM 2701 Organic Chemistry 2 ....... 5
Goal 4: MATH 2750 Calculus 2 ................... 4
MnTC Elective: ENGL 1712 Composition 2 3
Focus Area Course(s) ................................ 5
Total Semester Credits ................................ 16

Fourth Semester
Goal 3: CHEM 2790 Research Project for Science and Engineering Technology. 1-4
MnTC Elective: ENGL 1711 Composition 2 4
Recommended: COMM 17XX 1
Focus Area Course(s) ................................ 8
Total Semester Credits ................................ 13
Total Program Credits ............................... 60

Minimum Program Entry Requirements
Students entering this program must meet the following minimum program entry requirements:

Reading: Score of 250+ or grade of “C” or better in READ 0722
Writing: Score of 250+ or grade of “C” or better in ENGL 0922
Adv. Algebra & Functions: Score of 250+ 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 MATH, READ, and ENGL courses have additional prerequisites.
Engineering Broad Field AS DEGREE

Program Overview

Engineering is a profession that uses basic knowledge from the mathematical and natural sciences and utilizes the materials and forces of nature to develop systems that will perform optimally and economically for the benefit of mankind. The Engineering Broad Field program is designed to provide for a student's first two years of a four-year Engineering degree. The curriculum is designed to meet the needs of those students who have not yet decided on a specific engineering field. The program focuses on developing a fundamental knowledge of physics, chemistry, and mathematics.

Career Opportunities

Engineering occupations are expected to grow by more than 10% through 2020 according to the Bureau of Labor Statistics. Engineering includes careers with branches in civil, agricultural, chemical, electrical, mechanical, and aerospace sciences to name a few. This degree is part of a state-wide articulation program and designed to transfer easily.

Program Outcomes

1. Apply knowledge of mathematics, science, and engineering in the solution of engineering problems.
2. Design and conduct experiments as well as analyze and interpret results.
3. Design and engineering system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Understand professional and ethical responsibility.
5. Recognize the need for and develop an ability to engage in life-long professional development and learning.
6. Utilize techniques, skills, and modern engineering tools necessary for engineering practice.

Program Requirements

☐ Check off when completed

Course Cr
☐ ENGR 1707 Introduction to Engineering ........ 3
Choose a focus:
Electrical
☐ CHEM 1712 Principles of Chemistry 2 ........... 4
☐ ENGR 1709 Digital Electronics .................. 3
☐ ENGR 1717 Circuit Analysis 1 .................... 4
☐ ENGR 2705 Statics .......................... 3
☐ ENGR 2710 Dynamics .......................... 3
Mechanical or Manufacturing or Composite
☐ CHEM 1712 Principles of Chemistry 2 ........... 4
☐ ENGR 1717 Circuit Analysis 1 .................... 4
☐ ENGR 2705 Statics .......................... 3
☐ ENGR 2710 Dynamics .......................... 3
☐ ENGR 2712 Deformable Body Mechanics .......... 3
Civil
☐ CHEM 1712 Principles of Chemistry 2 ........... 4
☐ ENGR 2705 Statics .......................... 3
☐ ENGR 2710 Dynamics .......................... 3
☐ ENGR 2712 Deformable Body Mechanics .......... 3
☐ ENGR 2715 Thermodynamics ..................... 3
☐ ENGR Elective .................................. 1
Computer
☐ CSCI 1410 Comp. Science & Info Systems .......... 4
☐ CSCI Electives .................................. 6
☐ ENGR 1709 Digital Electronics .................. 3
☐ ENGR 1717 Circuit Analysis 1 .................... 4
Integrating
☐ CHEM 1712 Principles of Chemistry 2 ........... 4
☐ ENGR 1717 Circuit Analysis 1 .................... 4
☐ ENGR 2705 Statics .......................... 3
☐ ENGR 2710 Dynamics .......................... 3
☐ ENGR Elective .................................. 3
Subtotal ........................................ 20

General Education/MnTC Requirements Cr
☐ Refer to the Minnesota Transfer Curriculum Course List for each Goal Area
☐ Goal 1: Communication .......................... 4
☐ ENGL 1711 Composition 1 – 4 cr
☐ Goal 3: Natural Sciences .......................... 14
☐ CHEM 1711 Principles of Chemistry 1 – 4 cr
☐ PHYS 2700 General Physics 1 – 5 cr
☐ PHYS 2710 General Physics 2 – 5 cr
☐ Goal 4: Mathematical/Logical Reasoning ........ 16
☐ MATH 2749 Calculus 1 – 4 cr
☐ MATH 2750 Calculus 2 – 4 cr
☐ MATH 2753 Multivariable Calculus – 4 cr
☐ MATH 2760 Differential Equations & Linear Algebra – 4 cr
☐ Goal 5: History, Social Science and Behavioral Sciences ................. 3
☐ Goal 6: Humanities and Fine Arts .................. 3
* The course selected for goal area 5 or 6 must also satisfy goal 7, 8, 9, or 10.

General Education Requirements .................................. 40
Total Program Credits ................................................. 60

Course Sequence

The course sequence listed on the back of this guide is recommended for a full-time student. Not all courses are offered every semester. Students should consult with the Program Faculty each semester.

Minimum Program Entry Requirements

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

Reading: Score of 250+ or grade of “C” or better in READ 0722
Writing: Score of 250+ on Reading Comprehension or grade of “C” or better in ENGL 0922
Adv. Algebra & Functions: Score of 250+ 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 MATH, READ, and ENGL courses have additional prerequisites.

Information is subject to change.
This Program Requirements Guide is not a contract.
### Program Requirements Guide 2020 - 2021

#### Engineering Broad Field AS DEGREE (continued)

**Program Start Dates**

Fall, Spring, Summer

**Course Sequence**

This course sequence is recommended for a full-time student. Not all courses are offered every semester. Students should consult with the Program Faculty each semester.

**First Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 1707 Introduction to Engineering</td>
<td>3</td>
</tr>
<tr>
<td>Goal 1: ENGL 1711 Composition</td>
<td>4</td>
</tr>
<tr>
<td>Goal 3: CHEM 1711 Principles of Chemistry 1</td>
<td>4</td>
</tr>
<tr>
<td>Goal 4: MATH 2749 Calculus 1</td>
<td>4</td>
</tr>
</tbody>
</table>

**Total Semester Credits** 15

**Second Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal 3: CHEM 1712 Principles of Chemistry 2</td>
<td>4</td>
</tr>
<tr>
<td>Goal 3: PHYS 2700 General Physics 1</td>
<td>5</td>
</tr>
<tr>
<td>Goal 4: MATH 2750 Calculus 2</td>
<td>4</td>
</tr>
<tr>
<td>Goal 5: History, Social Science and</td>
<td></td>
</tr>
<tr>
<td>Behavioral Sciences</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Semester Credits** 16

**Third Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 2705 Statics</td>
<td>3</td>
</tr>
<tr>
<td>Goal 3: PHYS 2710 General Physics 2</td>
<td>5</td>
</tr>
<tr>
<td>Goal 4: MATH 2753 Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>Goal 6: Humanities and Fine Arts</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Semester Credits** 15

**Fourth Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 1717 Circuit Analysis</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 2710 Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 2712 Deformable Body Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Goal 4: MATH 2760 Differential Equations &amp;</td>
<td></td>
</tr>
<tr>
<td>Linear Algebra</td>
<td>4</td>
</tr>
</tbody>
</table>

**Total Semester Credits** 14

**Total Program Credits** 60

**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 saintpaul.edu/Transfer.

**Engineering Broad Field AS**

<table>
<thead>
<tr>
<th>Degree</th>
<th>Program Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS</td>
<td>Composite Materials Engineering</td>
<td>Winona State University</td>
</tr>
<tr>
<td>BS</td>
<td>Computer Engineering</td>
<td>Saint Cloud State University</td>
</tr>
<tr>
<td>BS</td>
<td>Electrical Engineering</td>
<td>Saint Cloud State University</td>
</tr>
<tr>
<td>BS</td>
<td>Manufacturing Engineering</td>
<td>Saint Cloud State University</td>
</tr>
<tr>
<td>BS</td>
<td>Mechanical Engineering</td>
<td>Saint Cloud State University</td>
</tr>
<tr>
<td>BS</td>
<td>Mechanical Engineering</td>
<td>Dunwoody College of Technology</td>
</tr>
<tr>
<td>BSCE</td>
<td>Civil Engineering</td>
<td>Minnesota State University, Mankato</td>
</tr>
<tr>
<td>BSE</td>
<td>General Engineering</td>
<td>Minnesota State University, Mankato</td>
</tr>
<tr>
<td>BSE</td>
<td>Integrated Engineering</td>
<td>Minnesota State University, Mankato</td>
</tr>
<tr>
<td>BSE   *</td>
<td>Electrical Engineering</td>
<td>Minnesota State University, Mankato</td>
</tr>
<tr>
<td>BSEE</td>
<td>Electrical Engineering</td>
<td>Minnesota State University, Mankato</td>
</tr>
<tr>
<td>BSEC</td>
<td>Computer Engineering</td>
<td>Minnesota State University, Mankato</td>
</tr>
<tr>
<td>BSME</td>
<td>Mechanical Engineering</td>
<td>Minnesota State University, Mankato</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Program Overview
This program prepares students for jobs in the exciting computer graphics and animation field. Students will learn how to take an idea from concept through production including computer graphics, computer animation, sound and video.

Computer Graphics Specialists can work in a wide variety of creative jobs including web design, film and animation production, CD ROM production and any organization that can benefit from these special talents. With more and more animation moving to the desktop, the computer graphics specialist is becoming a high demand career.

Careers
The computer graphics field relates to many jobs in the multimedia area including but not limited to:
• Web Designer
• Computer Animator
• Computer Game Designer and Developer
• Multimedia Developer

Career Opportunities
The computer graphics field relates to many jobs in the multimedia area including but not limited to:
• Web Designer
• Computer Animator
• Computer Game Designer and Developer
• Multimedia Developer

Program Outcomes
1. Graduates will design multiple visual graphic projects using industry standard software in both print and web formats.
2. Graduates will develop multiple websites using various HTML tools for both standard and mobile platforms.
3. Graduates will demonstrate fundamental animation techniques in both 2D and 3D environments.

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 saintpaul.edu/Transfer.

Program Faculty
Darren Pearson
darren.pearson@saintpaul.edu

Recommended Equipment
Digital Camera, USB Drive, Adobe Software

Estimated Book Cost
$50 - $75 per class

Program Requirements
☐ Check off when completed

Course
☐ CSCI 1450 Web Fundamentals/HTML .................. 4
☐ DGIM 1400 Introduction to Computer Graphics .... 4
☐ DGIM 1443 Graphical Web Design 1 ................. 2
☐ DGIM 1448 Adobe Animate 1 .......................... 2
☐ DGIM 1480 InDesign ..................................... 2
☐ DGIM 1483 Photoshop 1 ................................. 2
☐ DGIM 1484 Photoshop 2 ................................. 2
☐ DGIM 1540 Blogging Applications ..................... 2
☐ DGIM 2586 Digital Sound ................................ 2
☐ DGIM 2587 Digital Video 1 ............................. 2
☐ Technical Electives ........................................ 6
☐ Any 6 credits in DGIM or CSCI

Subtotal .................................................. 30

General Education/MnTC Requirements Cr
Students must select courses from at least six (6) different Goal Areas of the MnTC.

Goal 1: Communication ..................................... 7
☐ COMM 17XX Communication 1 – 4 cr
☐ COMM 17XX Communication 1 – 3 cr

Goal 2: Quantitative Reasoning, Algebra & Statistics .... 3
☐ MATH 1711 Composition 1 .................................. 3
☐ MATH 1711 Composition 1 - 3 cr

Goal 6: Humanities and Fine Arts .......................... 7
☐ ARTS 1713 Photography 1 – 3 cr (recommended)
☐ ARTS 1713 Photography 1 – 3 cr

Goals 1-10 of the Minnesota Transfer Curriculum Course List for each Goal Area.

Technical Electives ........................................ 4

Total Program Credits ................................. 60

Minimum Program Entry Requirements
Students entering this program must meet the following minimum program entry requirements:

Reading: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922
Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922
Quant. Reasoning, Algebra & Stats: Score of 270+ or Adv. Algebra & Functions: Score of 250+ 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 MATH, READ, and ENGL courses have additional prerequisites.

Information is subject to change. This Program Requirements Guide is not a contract.
Visualization Technology AAS DEGREE

Program Overview
This program prepares students for jobs in the exciting computer graphics and animation field. Students will learn how to take an idea from concept through production, including computer graphics, computer animation, sound and video.

Computer Graphics Specialists can work in a wide variety of creative jobs including web design, film and animation production, CD ROM production and any organization that can benefit from these special talents. With more and more animation moving to the desktop, the computer graphics specialist is becoming a high demand career.

The student should be creative and have excellent communication skills. Students should exhibit qualities of patience and precision and enjoy working both independently and on team projects.

Career Opportunities
The computer graphics field relates to many jobs in the multimedia area including but not limited to:
- Web Designer
- Computer Animator
- Computer Game Designer and Developer
- Multimedia Developer

Program Outcomes
1. Graduates will design multiple visual graphic projects using industry standard software in both print and web formats.
2. Graduates will develop multiple websites using various HTML tools for both standard and mobile platforms.
3. Graduates will demonstrate fundamental animation techniques in both 2D and 3D environments.
4. Graduates will develop web based student portfolios to promote employment opportunities.

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 saintpaul.edu/Transfer.

Visualization Technology AAS
BA Individualized Studies
Metropolitan State University
BS Information Technology
Saint Mary’s University,
Twin Cities Campus
BS Marketing
Saint Mary’s University,
Twin Cities Campus
BS Operations Management
Minnesota State University, Moorhead

Program Faculty
Darren Pearson
darren.pearson@saintpaul.edu

Recommended Equipment
USB Drive, Digital Camera, Adobe Software

Estimated Book Cost
$50 - $75 per class

Program Requirements
☐ Check off when completed

Course
Cr
☐ CSCI 1450 Web Fundamentals/HTML ............. 4
☐ DGIM 1400 Introduction to Computer Graphics ... 4
☐ DGIM 1448 Adobe Animate 1 .................... 2
☐ DGIM 1449 Adobe Animate 2 .................... 2
☐ DGIM 1480 InDesign .......................... 2
☐ DGIM 2560 Illustrator ........................... 4
☐ DGIM 2569 Digital Portfolio Development ....... 2
☐ DGIM 2587 Digital Video 1 ..................... 2
☐ DGIM 2588 Digital Video 2 ..................... 2
☐ Technical Electives ........................... 4
Any 4 credits in DGIM or CSCI; ensure technical elective is not part of selected emphasis

Subtotal ........................................ 28
Select one of the emphases listed below

Web Emphasis
☐ CSCI 1470 Web Design .......................... 4
☐ DGIM 1443 Graphical Web Design 1 .......... 2
☐ DGIM 1444 Graphical Web Design 2 .......... 2
☐ DGIM 1483 Photoshop 1 ....................... 2
☐ DGIM 1484 Photoshop 2 ....................... 2
Total Emphasis Credits ....................... 12

Animation Emphasis
☐ DGIM 1490 3D Animation Fundamentals ...... 4
☐ DGIM 2520 3D Character Animation .......... 4
☐ DGIM 2704 3D Animation Capstone .......... 4
Total Emphasis Credits ....................... 12

General Education/MnTC Requirements Cr
Refer to the Minnesota Transfer Curriculum Course List for each Goal Area
☐ Goal 1: Communication ........................... 7
☐ ENGL 1711 Composition 1 – 4 cr
☐ COMM 17XX – 3 cr
☐ Goal 4: Mathematics/Logical Reasoning ....... 3
☐ MATH 1730 College Algebra – 3 cr OR
☐ PHIL 1710 Logic – 3 cr
☐ Goal 5: History, Social Science and
Behavorial Sciences .............................. 3
☐ Goal 6: Humanities and Fine Arts .......... 3
☐ Goals 1-10 of the Minnesota Transfer Curriculum .... 4
Select a minimum of 4 additional credits
General Education Requirements .......... 20

Total Program Credits ....................... 60

Program Start Dates
Fall, Spring

Part-Time/Full-time Options
This program can be completed by using a combination of day, evening, and Saturday courses. Part-time and full-time options are available.

Course Sequence
The following course sequence is recommended; however, this sequence is not required. Contact the Program Faculty with questions.

Minimum Program Entry Requirements
Students entering this program must meet the following minimum program entry requirements:

Reading: Score of 250+ or grade of “C” or better in READ 0722
Writing: Score of 270+ on Reading
Quant. Reasoning, Algebra & Stats: Score of 270+ or Adv. Algebra & Functions: Score of 270+ 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 MATH, READ, and ENGL courses have additional prerequisites.

Information is subject to change.
This Program Requirements Guide is not a contract.
**Visualization Technology** AAS DEGREE (continued)

**Course Sequence**

The following course sequence is recommended; however, this sequence is not required. Contact the Program Faculty with questions.

**First Semester**
- CSCI 1450 Web Fundamentals/HTML ............. 4
- DGIM 1400 Introduction to Computer Graphics ........ 4
- DGIM 1448 Adobe Animate 1 ................... 2
- Goal 1: ENGL 1711 Composition I ............... 4

**Total Semester Credits**: 14

**Second Semester**
- DGIM 1449 Adobe Animate 2 ................... 2
- DGIM 2560 Illustrator .......................... 4
- Goal 1: COMM 17XX .......................... 3
- Goal 5: History, Social and Behavioral Sciences ....... 3
- Emphasis Course ............................. 4

**Total Semester Credits**: 16

**Third Semester**
- DGIM 2569 Digital Portfolio Development ......... 2
- DGIM 2587 Digital Video 1 ...................... 2
- Goal 4: MATH 1730 College Algebra
  - OR PHIL 1710 Logic .......................... 3
- Emphasis Course .............................. 4
- Technical Elective(s) ........................... 4

**Total Semester Credits**: 15

**Fourth Semester**
- DGIM 1480 InDesign ........................... 2
- DGIM 2588 Digital Video 2 ...................... 2
- Goal 6: Humanities and Fine Arts ................. 3
- MnTC Electives ............................... 4
- Emphasis Course .............................. 4

**Total Semester Credits**: 15

**Total Program Credits**: 60
Visualization Technology CERTIFICATE

Program Overview
This certificate program is a series of entry level courses that are part of the Visualization Technology AAS degree at Saint Paul College.

This certificate option is available for students who may choose not to complete the entire AAS degree and gain some experience with courses used in computer graphics, particularly courses in the Adobe software suite.

Career Opportunities
The computer graphics field relates to many jobs in the multimedia area including but not limited to:
- Web Designer
- Computer Animator
- Computer Game Designer and Developer
- Multimedia Developer

Program Outcomes
1. Graduates will design multiple visual graphic projects using industry standard software in both print and web formats.
2. Graduates will demonstrate fundamental animation techniques in 2D animation.
3. Graduates will develop web based student portfolios to promote employment opportunities.

Program Faculty
Darren Pearson
darren.pearson@saintpaul.edu

Course Offering Options
This program can be completed by using a combination of day, evening, and Saturday courses. Part-time and full-time options are available.

Recommended Equipment
Digital Camera, USB Drive, Adobe Software

Estimated Book Cost
$50 - $75 per class

Program Start Dates
Fall, Spring

Course Sequence
The following sequence is recommended; however, this sequence is not required. Contact the Program Faculty with questions.

First Semester
- DGIM 1400 Introduction to Computer Graphics .... 4
- DGIM 1443 Graphical Web Design 1 ....... 2
- DGIM 1448 Adobe Animate 1 ........... 2
- DGIM 1483 Photoshop 1 ............. 2
- DGIM 2560 Illustrator .................. 4
Subtotal .................................. 14

Second Semester
- DGIM 1443 Graphical Web Design 1 ....... 2
- DGIM 1448 Adobe Animate 1 ........... 2
- DGIM 1483 Photoshop 1 ............. 2
- DGIM 2560 Illustrator .................. 4
- Technical Electives ...................... 4
Any DGIM or CSCI
- General Education Requirements ............. 3
General Education Requirements ~3 cr
Goal 6: Humanities and Fine Arts
ARTS 17XX (recommended)

Total Semester Credits ...................... 11
Total Program Credits ..................... 21

Minimum Program Entry Requirements
Students entering this program must meet the following minimum program entry requirements:
- Reading: Score of 225+
- Arithmetic: Score of 200+

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 MATH, READ, and ENGL courses have additional prerequisites.

Program Requirements
☐ Check off when completed

Course         Cr
☐ DGIM 1400 Introduction to Computer Graphics .... 4
☐ DGIM 1443 Graphical Web Design 1 .......... 2
☐ DGIM 1448 Adobe Animate 1............ 2
☐ DGIM 1483 Photoshop 1 ............ 2
☐ DGIM 2560 Illustrator .................. 4
Subtotal .................. 14

☐ Technical Electives ...................... 4
Any DGIM or CSCI
☐ General Education Requirements ............. 3
General Education Requirements ~3 cr
Goal 6: Humanities and Fine Arts
ARTS 17XX (recommended)

Total Program Credits ..................... 21

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

Program Overview
The Computer Animation Certificate is intended to give students the skills needed to work as a digital animator. The classes required for this certificate will have students learning the most up-to-date animation and video software packages including Blender, Flash, Premiere Pro, After Effects and other applications. Intensive hands-on participation will be stressed in creating 3D models, animations, and scenes. Emphasis is placed on practical, real-world application of their skills. Upon certificate completion, students will have multiple short animation projects suitable for a portfolio or demo reel.

Career Opportunities
Many career opportunities exist in the computer animation field, particularly for individuals with extensive portfolios. Jobs exist in the video game industry, web design and advertising focused on emerging technologies. Many computer animators begin their career as self-employed, freelancers, in order to expand their personal portfolio.

Program Outcomes
1. Graduates will design multiple mesh models within 3D environment.
2. Graduates will apply industry standard techniques of lighting, texturing and animation to mesh models within a 3D environment.
3. Graduates will animate characters utilizing lip sync, forward kinematics, inverse kinematics and other industry standard practices.

Program Faculty
Darren Pearson
darren.pearson@saintpaul.edu

Course Offering Options
This program can be completed by using a combination of day, evening, and Saturday courses. Part-time and full-time options are available.

Recommended Equipment
Digital Camera, USB Drive, Adobe Software

Program Requirements
☐ Check off when completed

Course       Cr
☐ DGIM 1490 3D Animation Fundamentals  ........ 4
☐ DGIM 2520 3D Character Animation ............ 4
☐ DGIM 2587 Digital Video 1 ................... 2
☐ DGIM 2588 Digital Video 2 ................... 2
☐ DGIM 2704 3D Animation Capstone ............ 4
☐ DGIM XXXX .................................. 2
(Select any 2 credits in DGIM not already required for this program)

Total Program Credits  . . . . . . . . . . . . . . . . . . 18

Program Start Dates
Fall

Course Sequence
The following course sequence is recommended; however, this sequence is not required. Contact the Program Faculty with questions.

First Semester
DGIM 1490 3D Animation Fundamentals
(fall only) .................................. 4
DGIM XXXX .................................. 2
(Select any 2 credits in DGIM not already required for this program)

Total Semester Credits  . . . . . . . . . . . . . . . . . . 6

Second Semester
DGIM 2520 3D Character Animation .............. 4
DGIM 2587 Digital Video 1 ...................... 2
DGIM 2588 Digital Video 2 ...................... 2

Total Semester Credits  . . . . . . . . . . . . . . . . . . 8

Third Semester
DGIM 2704 3D Animation Capstone .............. 4

Total Semester Credits  . . . . . . . . . . . . . . . . . . 4

Total Program Credits  . . . . . . . . . . . . . . . . . . 18

Minimum Program Entry Requirements
Students entering this program must meet the following minimum program entry requirements:

Reading: Score of 225+
Arithmetic: Score of 200+

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 MATH, READ, and ENGL courses have additional prerequisites.
Web Design CERTIFICATE

Program Overview
This program prepares students for jobs in the exciting computer graphics field. Students will learn how to take an idea from concept through production including computer graphics and computer animation.

The student should be creative and have excellent communications skills. Students should exhibit qualities of patience and precision and should enjoy working both independently and on team projects.

Career Opportunities
The computer graphics field relates to many jobs in the multimedia area including but not limited to:
- Web Designer
- Web Developer

Program Outcomes
1. Graduates will design websites using front-end, web design software packages.
2. Graduates will incorporate industry standard usability and accessibility practices into web designs.
3. Graduates will employ industry standard web animation practices.

Program Faculty
Darren Pearson
darren.pearson@saintpaul.edu

Recommended Equipment
USB Drive, Digital Camera, Adobe Software

Program Requirements
☐ Check off when completed

Course  Cr
☐ CSCI 1450 Web Fundamentals/HTML ........... 4
☐ CSCI 1470 Web Design .......................... 4
☐ CSCI 2440 Client Side Programming 1 ........ 4
☐ DGIM 1443 Graphical Web Design 1 ............ 2
☐ DGIM 1448 Adobe Animate 1 ................. 2
☐ DGIM 2521 2D Web Animation ............... 2

Total Program Credits ....................... 18

Program Start Dates
Fall, Spring

Course Sequence
The following course sequence is recommended; however, this sequence is not required. Contact the Program Faculty with questions.

First Semester
CSCI 1450 Web Fundamentals/HTML ............ 4
DGIM 2521 2D Web Animation ........................ 2
Total Semester Credits ........................... 6

Second Semester
CSCI 1470 Web Design ............................ 4
DGIM 1443 Graphical Web Design 1 ............ 2
DGIM 1448 Adobe Animate 1 ................. 2
Total Semester Credits ........................... 8

Third Semester
CSCI 2440 Client Side Programming 1 ........... 4
Total Semester Credits ........................... 4

Total Program Credits ....................... 18

Minimum Program Entry Requirements
Students entering this program must meet the following minimum program entry requirements:

Reading: Score of 250+ or grade of “C” or better in READ 0722
Writing: Score of 250+ on Reading Comprehension or grade of “C” or better in ENGL 0922
Quant. Reasoning, Algebra & Stats: Score of 250+ or Adv. Algebra & Functions: Score of 215+ or grade of "C" or better in MATH 0910

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 MATH, READ, and ENGL courses have additional prerequisites.

Degree option may have a greater requirement than this certificate.

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

Program Overview
CyberSecurity professionals work in a wide variety of information technology positions, but have a focus on information assurance, cyber ethics, and incident detection, investigation and response. Students completing this degree will be able to investigate and defend computer systems against cyber-attacks, unauthorized use or modification, and exploitation.

Students entering into this program of study should have excellent communication, reading and math skills. Throughout the program students will experience coursework that will help them develop skills such as critical thinking, performance monitoring, decision making and evaluating systems and organizations.

The CyberSecurity program at Saint Paul College is 60 credits in length. The program provides 16 credits specifically related to CyberSecurity which will aid students in the field and in potential certifications.

Career Opportunities
CyberSecurity professionals will find a growing need in both public and private employment sectors. Graduates will find excellent opportunities as systems administrators, network engineers, system programmers, and systems specialists.

Program Outcomes
1. Graduates will have knowledge and skills in system design, analysis and maintenance.
2. Graduates will have the skills to gather, monitor, and analyze multiple sources of data to identify changes in circumstances or events.
3. Graduates will have the skills to evaluate information to determine compliance with security standards.
4. Graduates of the CyberSecurity program will be prepared for employment as information Security Analysts or Computer Systems Analysts.

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 saintpaul.edu/Transfer.

CyberSecurity AAS
BA Individualized Studies
Metropolitan State University
BS Information Technology
Saint Mary’s University,
Twin Cities Campus
BS Operations Management
Minnesota State University, Moorhead

Program Faculty
Mark Rawlings
mark.rawlings@saintpaul.edu
James Woodcock
james.woodcock@saintpaul.edu

Program Requirements
☐ Check off when completed

Course Cr
☐ CSCI 1410 Computer Science & Information Systems ........................................ 4
☐ CSCI 1423 Computer Networking 1 – Client ....................................................... 4
☐ CSCI 1440 Networking Fundamentals ................................................................. 4
☐ CSCI 1523 Intro to Computing and Programming Concepts ................................ 4
☐ CSCI 2420 Computer Security ........................................................................... 4
☐ CSCI 2461 Computer Networking 3 – Linux ......................................................... 4
☐ CSCI 2465 Computer Networking 4 – Infrastructure ......................................... 4
☐ CSCI 2480 Network Security and Penetration Prevention .................................. 4
☐ CSCI 2482 Security Incident Handling, Response and Disaster Recovery .......... 4
☐ CSCI 2484 Ethical Hacking & Countermeasures ................................................. 4
☐ CSCI 2570 Machine Architecture and Organization ............................................ 4
Subtotal ........................................... 44

General Education/MnTC Requirements Cr
Refer to the Minnesota Transfer Curriculum Course List for each Goal Area
☐ Goal 1: Communication ................................................................................. 7
☐ ENGL 1711 Composition 1 – 4 cr
☐ COMM 17XX – 3 cr
☐ Goal 3 or Goal 4 ................................................................................... 3
☐ Goal 3: Natural Sciences
☐ OR Goal 4: Mathematical /Logical Reasoning ............................................. 3
☐ (MATH 1730 or proficiency required)
☐ Goal 6: Humanities and Fine Arts ................................................................. 3
☐ (PHIL 1720 Ethics is recommended)
General Education Requirements ................................................................. 16

Total Program Credits ......................... 60

See back of this guide for Course Chart

Program Start Dates
Fall, Spring, Summer

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 each summer term. Students should consult with the Program Faculty each semester.

First Semester
CSCI 1410 Computer Science & Information Systems ........................................ 4
CSCI 1423 Computer Networking 1 – Client ....................................................... 4
CSCI 1440 Networking Fundamentals ................................................................. 4
Goal 1: ENGL 1711 Composition 1 ................................................................. 4
Total Semester Credits ................................................................. 16

Second Semester
CSCI 1523 Intro to Computing and Programming Concepts ................................ 4
CSCI 2461 Computer Networking 3 – Linux ......................................................... 4
Goal 3: Natural Sciences
OR Goal 4: Mathematical /Logical Reasoning ............................................. 3
☐ (MATH 1730 or proficiency required)
Goal 6: Humanities and Fine Arts ................................................................. 3
Total Semester Credits ................................................................. 16

Third Semester
CSCI 2420 Computer Security ........................................................................... 4
CSCI 2465 Computer Networking 4 – Infrastructure ......................................... 4
CSCI 2482 Security Incident Handling, Response and Disaster Recovery .......... 4
CSCI 2570 Machine Architecture and Organization ............................................ 4
Total Semester Credits ................................................................. 16

Fourth Semester
CSCI 2480 Network Security and Penetration Prevention .................................. 4
CSCI 2484 Ethical Hacking and Countermeasures ............................................. 4
Goal 1: COMM 17XX .................................................................................. 3
Goal 5: History, Social Science and Behavioral Sciences ................................. 3
Total Semester Credits ................................................................. 14

Total Program Credits ................................................................. 60

Information is subject to change.
This Program Requirements Guide is not a contract.
CyberSecurity  AAS DEGREE (continued)
(44 credits + 16 GenEd credits)

The below chart illustrates the courses required for completion of this degree.

Minimum Program Entry Requirements
Students entering this program must meet the following minimum program entry requirements:

- **Reading:** Score of 250+ or grade of "C" or better in READ 0722
- **Writing:** Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922
- **Adv. Algebra & Functions:** Score of 250+ 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 MATH, READ, and ENGL courses have additional prerequisites.
Program Overview

Note: Students must have completed the Computer Network Engineering AAS degree or have instructor approval.

CyberSecurity professionals work in a wide variety of information technology positions, but have a focus on information assurance, cyber ethics, and incident detection, investigation and response. Students completing this degree will be able to investigate and defend computer systems against cyber-attacks, unauthorized use or modification, and exploitation.

Students entering into this program of study should have excellent communication, reading and math skills. Throughout the program students will experience coursework that will help them develop critical skills such as critical thinking, performance monitoring, decision making and evaluating systems and organizations.

The CyberSecurity certificate program at Saint Paul College is 24 credits in length. The program provides 16 credits specifically related to CyberSecurity which will aid students in the field and in potential certifications.

Career Opportunities

CyberSecurity professionals will find a growing need in both the public and private employment sectors. Graduates will find excellent opportunities as systems administrators, network engineers, system programmers, and systems specialists.

Program Outcomes

1. Graduates will have knowledge and skills in system design, analysis and maintenance.
2. Graduates will have the skills to gather, monitor, and analyze multiple sources of data to identify changes in circumstances or events.
3. Graduates will have the skills to evaluate information to determine compliance with security standards.
4. Graduates of the CyberSecurity program will be prepared for employment as Information Security Analyst or Computer Systems Analysts.

Program Faculty

Mark Rawlings
mark.rawlings@saintpaul.edu

James Woodcock
james.woodcock@saintpaul.edu

Program Requirements

☐ Check off when completed

<table>
<thead>
<tr>
<th>Course</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 1440 Networking Fundamentals</td>
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</tr>
<tr>
<td>CSCI 2420 Computer Security</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 2451 Computer Networking 2 - Server</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 2480 Network Security and Penetration Prevention</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 2482 Security Incident Handling, Response and Disaster Recovery</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 2484 Ethical Hacking &amp; Countermeasures</td>
<td>4</td>
</tr>
</tbody>
</table>

Subtotal                                      24

Total Program Credits                         24

Program Start Dates

Fall, Spring

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

CSCI 1440 Networking Fundamentals            4
CSCI 2420 Computer Security                  4
CSCI 2451 Computer Networking 2 - Server    4
CSCI 2480 Network Security and Penetration Prevention 4
CSCI 2482 Security Incident Handling, Response and Disaster Recovery 4
CSCI 2484 Ethical Hacking & Countermeasures  4

Total Semester Credits                      12

Second Semester

CSCI 2480 Network Security and Penetration Prevention 4
CSCI 2482 Security and Incident Handling, Response and Disaster Recovery 4
CSCI 2484 Ethical Hacking & Countermeasures 4

Total Semester Credits                      12

Total Program Credits                      24

Minimum Program Entry Requirements

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

Reading: Score of 250+ or grade of “C” or better in READ 0722

Writing: Score of 250+ on Reading Comprehension or grade of “C” or better in ENGL 0922

Quant. Reasoning, Algebra & Stats: Score of 250+ or Adv. Algebra & Functions: Score of 215+ or grade of “C” or better in MATH 0910

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 MATH, READ, and ENGL courses have additional prerequisites.

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

The Computer Science Transfer Pathway AS Degree is designed to provide students with opportunities for immediate employment or for transfer to four-year institutions. The College has developed articulation agreements with four-year institutions to assist students with their transfer goals. See a Pathway Advisor for further information. Students planning a career in this area should have above average mathematic reasoning and communication skills. Students should exhibit qualities of patience, and preciseness and enjoy working in a team environment.

## Career Opportunities

Graduates of this program may choose to continue their education at a four-year institution in a Computer Science or related field. Others may elect to enter the workforce following graduation. Graduates will find opportunities in the computer science field in the areas of programming or database management in business, manufacturing, government and education. With additional education and experience, students may advance to positions such as Database Analyst, Systems Analyst, Software Developer or Programmer-Analyst.

## Program Outcomes

1. Graduates will be able to develop complex algorithms which underlie common programming tasks.
2. Graduates will be able to construct and analyze the performance of complex data structures and use them to develop efficient computer programs.
3. Graduates will have a sound understanding of the mathematics that underlies Computer Science and be able to develop and deploy computer programs which utilize it.
4. Graduates of the program will have mastered the general education requirements for work and life roles.

### Program Faculty

- Warren Sheaffer  
  warren.sheaffer@saintpaul.edu

### Part-time/Full-time Options

Some day and evening class availability. Students may attend full-time or part-time.

### Program Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Cr</th>
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<tbody>
<tr>
<td>CSCI 1410 Computer Science &amp; Info Systems</td>
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</tr>
<tr>
<td>CSCI 1523 Intro to Computing and Programming Concepts</td>
<td>4</td>
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<tr>
<td>CSCI 1524 Intro to Algorithms &amp; Data Structures</td>
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<td>CSCI 1533 ANSI C Language Programming</td>
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<td>CSCI 1541 Java Programming</td>
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<td>CSCI 2460 Discrete Structures of Computer Science</td>
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<td>CSCI 2469 Advanced Programming Principles</td>
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<table>
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<td>COMM 17XX</td>
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<td>Phys 2700 General Physics 1</td>
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<td>Phys 2749 Calculus 1 - 4 cr</td>
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<td>MATH 1740 Introduction to Statistics - 4 cr</td>
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<td>MATH 1793 Calculus 1 - 4 cr</td>
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<td>MATH 1796 Introduction to Statistics - 4 cr</td>
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<tr>
<td>MATH 1797 Advanced Algebra &amp; Functions</td>
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<td>MATH 1798 Calculus 1 - 4 cr</td>
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<td>MATH 1799 Calculus 2 OR MATH 1800 Calculus 2</td>
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<td>MATH 1801 Introduction to Statistics - 4 cr</td>
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<td>MATH 1802 Advanced Algebra &amp; Functions</td>
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<td>MATH 1803 Calculus 1 - 4 cr</td>
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<td>MATH 1804 Calculus 2 OR MATH 1805 Calculus 2</td>
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<td>MATH 1806 Introduction to Statistics - 4 cr</td>
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<td>MATH 1807 Advanced Algebra &amp; Functions</td>
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<td>MATH 1808 Calculus 1 - 4 cr</td>
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<tr>
<td>MATH 1811 Introduction to Statistics - 4 cr</td>
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### General Education/MnTC Requirements

- Goal 1: Communication 9
- Goal 2: English 5
- Goal 3: Math 4
- Goal 4: Math 4
- Goal 5: History, Social Sciences, Behavioral Sciences
- Goal 6: Humanities and Fine Arts
- Goal 7: Natural Sciences
- Goal 8: Physical Education

### Total Program Credits

60

* Please refer to specific articulation agreements to determine the best mathematics option.

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### Minimum Program Entry Requirements

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

- **Reading:** Score of 250+ or grade of “C” or better in READ 0722
- **Writing:** Score of 250+ on Reading Comprehension or grade of “C” or better in ENGL 0922
- **Adv. Algebra & Functions:** Score of 250+ 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 MATH, READ, and ENGL courses have additional prerequisites.

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**Information is subject to change. This Program Requirements Guide is not a contract.**
Computer Science Transfer Pathway  AS DEGREE (continued)
(30 credits + 30 GenEd credits)

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 saintpaul.edu/Transfer.

<table>
<thead>
<tr>
<th>Computer Science Transfer Pathway AS</th>
<th>BS</th>
<th>Information Technology</th>
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</thead>
<tbody>
<tr>
<td>Bemidji State University</td>
<td>BS</td>
<td>Saint Mary’s University, Twin Cities Campus</td>
</tr>
<tr>
<td>BS Computer Science</td>
<td>BS</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Minnesota State University, Moorhead</td>
<td>BS</td>
<td>St. Cloud State University</td>
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<tr>
<td>BS Computer Science</td>
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<tr>
<td>BA Individualized Studies</td>
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</tr>
<tr>
<td>Metropolitan State University</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The below chart illustrates the courses required for completion of this degree.
Management Information Systems  AS DEGREE

Program Overview
The Associate of Science Degree in Management Information Systems is designed to provide students with opportunities for immediate employment or for transfer to four-year institutions. The College has developed articulation agreements with four-year institutions to assist students with their transfer goals. See a Transfer Specialist for further information.

Students planning a career in this area should have above average mathemetic reasoning and communication skills. Students should exhibit qualities of patience, perseverance, and preciseness, and should enjoy working in a team environment.

Career Opportunities
A management information system degree prepares the student for a career that combines business techniques and computer systems capability. Students study how to provide reporting and analysis using best practices in information technology.

Graduates will find opportunities in the information systems field in business, manufacturing, government and education.

With additional education and experience, students may advance to positions such as Systems Analyst, Software Architect and Business Analyst. Graduates of this program may choose to continue their education at a four-year institution in Management Information Systems or a related field. Others may elect to enter the workforce following graduation.

Program Outcomes
1. Graduates will be able to analyze complex business processes and develop process improvements and comprehensive information system requirements specifications to support them.
2. Graduates will be able to help build and test information systems in an organization.
3. Graduates will be able to utilize accounting and business systems information to develop recommendations for operating cost reduction and improved use of capital investment.
4. Graduates will have a sound understanding of business systems, current technologies, organizational structures, communication tools and critical thinking skills to help guide Management Information Systems success.

Program Faculty
Warren Sheaffer
warren.sheaffer@saintpaul.edu

Part-time and Full-time Options
This program can be completed by using a combination of day, evening, and Saturday courses. Part-time and full-time options are available.

Program Requirements
☐ Check off when completed

Course  Cr
☐ ACCT 2410 Financial Accounting .................. 4
☐ BUSN 2110 Principles of Marketing .................. 3
☐ BUSN 2450 Management Fundamentals ................. 3
☐ CSCI 1410 Computer Science & Information Systems .................. 4
☐ CSCI 1450 Web Fundamentals/HTML .................. 4
☐ CSCI 1523 Intro to Computing and Programming Concepts .................. 4
☐ CSCI 1550 Database Management Fundamentals .......... 4
☐ CSCI 2410 Management Information Systems ............. 3
Subtotal ........................................... 29
General Education/MnTC Requirements  Cr
Refer to the Minnesota Transfer Curriculum Course List for each Goal Area
☐ Goal 1: Communication .................................. 7
  ENGL 1711 Composition 1 – 4 cr
  COMM 17XX – 3 cr
☐ Goal 4: Mathematical/Logical Reasoning ............. 7-8
  MATH 1740 Introduction to Statistics – 4 cr
  MATH 1730 College Algebra – 3 cr OR
  MATH 2749 Calculus 1 – 4 cr
☐ Goal 5: History, Social Science and Behavioral Sciences .................. 6
  ECON 1720 Macroeconomics – 3 cr
  ECON 1730 Microeconomics – 3 cr
☐ Goals 1-10 of the Minnesota Transfer Curriculum ............. 10-11
  Select a minimum of 10-11 additional credits
  Students must select courses from at least six (6) Goal Areas of the Minnesota Transfer Curriculum.
General Education Requirements ................. 31

Total Program Credits .................. 60

Program Start Dates
Fall, Spring, Summer

Course Sequence
The following sequence is recommended for a full-time student. Not all courses are offered each semester.

First Semester
BUSN 2450 Management Fundamentals .................. 3
CSCI 1410 Computer Science & Info Systems ............. 4
Goal 1: ENGL 1711 Composition .................. 4
Goal 4: MATH 1730 College Algebra
  OR MATH 2749 Calculus 1 .................. 3-4
Total Semester Credits .................. 14-15

Second Semester
ACCT 2410 Financial Accounting .................. 4
BUSN 2110 Principles of Marketing .................. 3
CSCI 1523 Introduction to Computing and Programming Concepts ............. 4
Goal 4: MATH 1740 Introduction to Statistics ............. 4
Total Semester Credits .................. 15

Third Semester
CSCI 1450 Web Fundamentals/HTML .................. 4
CSCI 1550 Database Management Fundamentals .......... 4
Goal 1: COMM 17XX ................................ 3
Goal 5: ECON 1720 Macroeconomics .................. 3
MnTC Electives .................................... 3
Total Semester Credits .................. 17

Fourth Semester
CSCI 2410 Management Information Systems ............. 3
Goal 5: ECON 1730 Microeconomics .................. 3
MnTC Electives .................................... 7-8
Total Semester Credits .................. 13-14

Total Program Credits .................. 60

See back of this guide for Transfer Opportunities

Information is subject to change. This Program Requirements Guide is not a contract.
Management Information Systems AS DEGREE (continued)
(29 credits + 31 GenEd credits)

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 saintpaul.edu/Transfer.

The below chart illustrates the courses required for completion of this degree.

Minimum Program Entry Requirements

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

**Reading:** Score of 250+ or grade of “C” or better in READ 0722

**Writing:** Score of 250+ on Reading Comprehension or grade of “C” or better in ENGL 0922

**Adv. Algebra & Functions:** Score of 250+ 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 MATH, READ, and ENGL courses have additional prerequisites.
Program Overview
Networking Specialists can work in a wide variety of jobs. The work could include purchasing, installing, configuring, administrating and/or supporting. Some jobs in networking could include computer network support, user training, installing and maintaining local and/or wide area networks.

The student should have excellent communication and math skills. For the certificate programs, the student is expected to have prior microcomputer and/or networking experience. He/she should exhibit qualities of patience, perseverance and preciseness and be a logical thinker. The student should enjoy working in a team environment and be able to work independently.

Career Opportunities
With almost every size company connected to some type of network, the jobs in networking have become the fastest growing jobs in the computer field. With companies networking to share resources and reduce expenses the networking specialist is an invaluable part of the new company structure. There is a wide variety of jobs in networking including installation, maintenance, training, managing and user support.

Graduates find excellent opportunities as Network Administrators, Network Support, and Certified Network Engineers in business, manufacturing, government and education. Jobs for Networking Specialists for all types of installations are found throughout the country with opportunities for excellent earnings and rapid advancement. Jobs include the following:

• Networking Engineer
• Network Help Desk Support
• Data Communications Specialist
• PC Network Administrator
• Information Specialist
• WAN Manager Network Administrator
• LAN Specialist
• Telecommunications Specialist
• Certified Network Engineer
• LAN Manager

Program Outcomes
1. Graduates will have knowledge and skills in computer network engineering.
2. Graduates will have knowledge and experience in system design, analysis and maintenance.
3. Graduates of the Computer Network programs will be prepared for employment as computer network engineers.
4. Graduates will be prepared to take industry certification exams.

Program Faculty
Warren Sheaffer
warren.sheaffer@saintpaul.edu

Part-Time/Full-Time Options
Some day and evening class availability. Students may attend full time or part time.

Program Requirements
☐ Check off when completed
Course     Cr
☐ CSCI 1410 Computer Science & Information Systems ........................................... 4
☐ CSCI 1423 Computer Networking 1 – Client ........................................... 4
☐ CSCI 1440 Networking Fundamentals ........................................... 4
☐ CSCI 1523 Intro to Computing and Programming Concepts ........................................... 4
☐ CSCI 2420 Computer Security ........................................... 4
☐ CSCI 2451 Computer Networking 2 – Server ........................................... 4
☐ CSCI 2453 Computer Virtualization ........................................... 4
☐ CSCI 2461 Computer Networking 3 – Linux ........................................... 4
☐ CSCI 2465 Computer Networking 4 – Infrastructure ........................................... 4
☐ CSCI 2475 A+ Hardware/Operating System Prep ........................................... 4
☐ CSCI 2570 Machine Architecture and Organization ........................................... 4
Subtotal ........................................... 44

General Education Requirements Cr
Refer to the Minnesota Transfer Curriculum Course List for each Goal Area
☐ Goal 1: Communication ........................................... 7
ENGL 1711 Composition 1 – 4 cr
COMM 17XX – 3 cr
☐ Goal 3 or Goal 4 ........................................... 3
☐ Goal 3: Natural Sciences OR Goal 4: Mathematical/Logical Reasoning ........................................... 3
☐ Goal 5: History, Social Science and Behavioral Sciences ........................................... 3
☐ Goal 6: Humanities and Fine Arts ........................................... 3
General Education Requirements ........................................... 16

Total Program Credits ........................................... 60

Program Start Dates
Fall, Spring, Summer

Course Sequence
The following sequence is recommended for a full-time student. Not all courses are offered each semester.

First Semester
CSCI 1410 Computer Science & Information Systems ........................................... 4
CSCI 1423 Computer Networking 1 – Client ........................................... 4
CSCI 1440 Networking Fundamentals ........................................... 4
Goal 1: ENGL 1711 Composition 1 ........................................... 4
Total Semester Credits ........................................... 16

Second Semester
CSCI 1523 Intro to Computing and Programming Concepts ........................................... 4
CSCI 2451 Computer Networking 2 – Server ........................................... 4
CSCI 2461 Computer Networking 3 – Linux ........................................... 4
CSCI 2475 A+ Hardware/Operating System Prep ........................................... 4
Total Semester Credits ........................................... 16

Third Semester
CSCI 2453 Computer Virtualization ........................................... 4
Goal 1: COMM 17XX ........................................... 3
Goal 3: Natural Science
OR Goal 4: Mathematical/Logical Reasoning ........................................... 3
(MATH 1730 or proficiency required)
Goal 5: History, Social and Behavioral Sciences ........................................... 3
Goal 6: Humanities and Fine Arts ........................................... 3
Total Semester Credits ........................................... 16

Fourth Semester
CSCI 2420 Computer Security ........................................... 4
CSCI 2465 Computer Networking 4 – Infrastructure ........................................... 4
CSCI 2570 Machine Architecture and Organization ........................................... 4
Total Semester Credits ........................................... 12
Total Program Credits ........................................... 60

See back of this guide for Transfer Opportunities

Information is subject to change.
This Program Requirements Guide is not a contract.
Computer Network Engineering AAS DEGREE (continued)
(44 credits + 16 GenEd credits)

Minimum Program Entry Requirements
Students entering this program must meet the following minimum program entry requirements:

**Reading:** Score of 250+ or grade of “C” or better in READ 0722

**Writing:** Score of 250+ on Reading Comprehension or grade of “C” or better in ENGL 0922

**Adv. Algebra & Functions:** Score of 250+ 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 MATH, READ, and ENGL courses have additional prerequisites.

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 saintpaul.edu/Transfer.

The below chart illustrates the courses required for completion of this degree.

---

**Introductory**

- **CSCI 1423** Computer Networking 1 - Client
- **CSCI 1410** Computer Science & Information Systems
- **CSCI 1440** Networking Fundamentals

**Intermediate**

- **CSCI 2451** Computer Networking 2 - Server
- **CSCI 2461** Computer Networking 3 - Linux
- **CSCI 1523** Intro to Computing and Programming Concepts
- **CSCI 2465** Computer Networking 4 - Infrastructure
- **CSCI 2475** A+ Hardware/Operating System Preparation

**Advanced**

(offered once per year)

- **CSCI 2453** Computer Virtualization
- **CSCI 2420** Computer Security
- **CSCI 2570** Machine Architecture & Organization

---

**Math 1730** College Algebra (or proficiency)

---

**Computer Network Engineering AAS**

**BA** Individualized Studies
Metropolitan State University

**BS** Information Technology
Saint Mary’s University, Twin Cities Campus

**BS** Operations Management
Minnesota State University, Moorhead

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Program Requirements Guide 2020 - 2021

Saint Paul College—A Community & Technical College • 2020–2021 Catalog
Program Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Cr</th>
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<tbody>
<tr>
<td>CSCI 1410 Computer Science &amp; Information Systems</td>
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<tr>
<td>CSCI 1423 Computer Networking – Client</td>
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<tr>
<td>CSCI 1450 Web Fundamentals/HTML</td>
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<td>CSCI 1523 Intro to Computing and Programming Concepts</td>
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<td>CSCI 1524 Intro to Algorithms and Data Structures</td>
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<td>CSCI 1541 Java Programming</td>
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<td>CSCI 2570 Machine Architecture and Organization</td>
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Complete one of the Emphases listed below.  16

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<td>CSCI 1550 Database Management Fundamentals</td>
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<td>CSCI 2440 Client Side Programming I</td>
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<tr>
<td>CSCI 2466 J2EE-JSP and Servlets</td>
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<tr>
<td>Total Emphasis Credits</td>
<td>16</td>
</tr>
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</table>

Total Program Credits  60

<table>
<thead>
<tr>
<th>Program Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Design and code computer programming in a variety of a computer-programming languages.</td>
</tr>
<tr>
<td>2. Professionally structure and document source codes.</td>
</tr>
<tr>
<td>3. Utilize sound program testing procedures to insure the accuracy of the programs they develop.</td>
</tr>
<tr>
<td>4. Use current program coding conventions to develop well documented code.</td>
</tr>
<tr>
<td>5. Apply technical communication skills.</td>
</tr>
</tbody>
</table>

Program Faculty

Warren Sheaffer
warren.sheaffer@saintpaul.edu

Career Opportunities


Adv. Algebra & Functions: Score of 250+ 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 MATH, READ, and ENGL courses have additional prerequisites.

Minimum Program Entry Requirements

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

Reading: Score of 250+ or grade of “C” or better in READ 0722

Writing: Score of 250+ on Reading Comprehension or grade of “C” or better in ENGL 0922

Minimum Program Entry Requirements

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

Reading: Score of 250+ or grade of “C” or better in READ 0722

Writing: Score of 250+ on Reading Comprehension or grade of “C” or better in ENGL 0922

Adv. Algebra & Functions: Score of 250+ 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 MATH, READ, and ENGL courses have additional prerequisites.
Computer Programming  
**AAS DEGREE (continued)**  
(44 credits + 16 GenEd credits)

**Program Start Dates**  
Fall, Spring, Summer

**Course Sequence**  
The following sequence is recommended for a full-time student; however, this sequence is not required. Not all courses are offered each semester.

**First Semester**  
CSCI 1410 Computer Science & Information Systems ........................................... 4  
CSCI 1423 Computer Networking – Client ......................................................... 4  
CSCI 1450 Web Fundamentals/HTML ................................................................. 4  
Goal 3: Natural Sciences OR  
Goal 4: Mathematical/Logical Reasoning ......................................................... 3  
(MATH 1730 or proficiency required)  
**Total Semester Credits** ................................................................. 15

**Second Semester**  
CSCI 1523 Intro to Computing and Programming Concepts .......................... 4  
Goal 1: ENGL 1711 Composition ................................................................. 4  
Emphasis Course(s) .................................................................................. 8  
**Total Semester Credits** ................................................................. 16

**Third Semester**  
CSCI 1524 Intro to Algorithms and Data Structures ......................................... 4  
Goal 1: COMM 17XX .................................................................................. 3  
Emphasis Course(s) .................................................................................. 8  
**Total Semester Credits** ................................................................. 15

**Fourth Semester**  
CSCI 2570 Machine Architecture and Organization ........................................... 4  
Goal 5: History, Social and Behavioral Sciences .............................................. 3  
Goal 6: Humanities and Fine Arts ................................................................. 3  
Emphasis Course(s) .................................................................................. 4  
**Total Semester Credits** ................................................................. 14

**Total Program Credits** ................................................................. 60

**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 saintpaul.edu/Transfer.

**Computer Programming AAS**  
**BA** Individualized Studies  
Metropolitan State University  
**BS** Information Technology  
Saint Mary’s University, Twin Cities Campus  
**BS** Operations Management  
Minnesota State University, Moorhead

The below chart illustrates the courses required for completion of this degree.
**Program Overview**
The Network Administration Certificate is designed for individuals who already have acquired at least a minimum level of technical computer skills, either through previous education, training, and/or experience. It is designed to enhance one’s current computer knowledge and skills.

Networking Specialists can work in a wide variety of jobs. The work could include purchasing, installing, configuring, administering, and/or supporting. Some jobs in networking could include help desk support, user training, installing and maintaining local and/or wide area networks.

The student should have excellent communications and math skills. For the certificate programs the student is expected to have prior microcomputer and/or networking experience. He/she should exhibit qualities of patience, perseverance, and preciseness and be a logical thinker. The student should enjoy working in a team environment, and be able to work independently. All networking programs emphasize preparation for either the Microsoft Certified System Administration or Linux Professional Institute (LPI) Certification.

**Career Opportunities**
With almost every size company connected to some type of network, the jobs in networking have become the fastest growing jobs in the computer field. With companies networking to share resources and reduce expenses the networking specialist is an invaluable part of the new company structure. There is a wide variety of jobs in networking including installation, maintenance, training, managing and user support.

Graduates find excellent opportunities as Network Administrators, Network Support, and Certified Network Engineers in business, manufacturing, government and education. Jobs for Networking Specialists for all types of installations are found throughout the country with opportunities for excellent earnings and rapid advancement. Jobs include the following:

- Networking Engineer
- Network Help Desk Support
- Data Communications Specialist
- PC Network Administrator
- Information Specialist
- WAN Manager
- Network Administrator
- LAN Specialist
- Telecommunications Specialist
- Certified Network Engineer
- LAN Manager

**Program Outcomes**
1. Graduates will have knowledge and skills in computer network engineering.
2. Graduates will have knowledge and experience in computer network system design, analysis, and maintenance.
3. Graduates of the Computer Network Programs will be prepared for employment as computer network engineers.

**Program Faculty**
Warren Sheaffer
warren.sheaffer@saintpaul.edu

**Program Requirements**

<table>
<thead>
<tr>
<th>Course</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 1410 Computer Science &amp; Information Systems</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 1423 Computer Networking 1 – Client</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 1440 Networking Fundamentals</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 2451 Computer Networking 2 – Server</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 2461 Computer Networking 3 – Linux</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 2465 Computer Networking 4 – Infrastructure</td>
<td>4</td>
</tr>
</tbody>
</table>

Total Program Requirements: 24

**Program Start Dates**
Fall, Spring, Summer

**Course Sequence**
The following sequence is recommended for a part-time student. Not all courses are offered each semester.

**First Semester**
- CSCI 1410 Computer Science & Information Systems: 4
- CSCI 1423 Computer Networking 1 – Client: 4
- CSCI 1440 Networking Fundamentals: 4

Total Semester Credits: 8

**Second Semester**
- CSCI 1423 Computer Networking 1 – Client: 4
- CSCI 2465 Computer Networking 4 – Infrastructure: 4

Total Semester Credits: 8

**Third Semester**
- CSCI 2451 Computer Networking 2 – Server: 4
- CSCI 2461 Computer Networking 3 – Linux: 4

Total Semester Credits: 8

Total Program Credits: 24

See back of this guide for Course Chart

**Minimum Program Entry Requirements**
Students entering this program must meet the following minimum program entry requirements:

**Reading:** Score of 250+ or grade of “C” or better in READ 0922

**Writing:** Score of 250+ on Reading Comprehension or grade of “C” or better in ENGL 0922

**Quant. Reasoning, Algebra & Stats:** Score of 250+ or Adv. Algebra & Functions: Score of 215+ or grade of “C” or better in MATH 0901

**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 MATH, READ, and ENGL courses have additional prerequisites.

Information is subject to change. This Program Requirements Guide is not a contract.
Network Administration CERTIFICATE (continued)
(24 credits)

The below chart illustrates the courses required for completion of this certificate.
Java Programming CERTIFICATE

Program Overview
This is a 24 credit certificate program exploring the Java programming language and computing platform. The certificate includes a foundation course in computer science, a web fundamentals course, and an in depth study of databases. It then features a two-course sequence in Java programming and a course in Java for web development. This certificate may be completed apart from a degree program or may be selected as an emphasis in the Computer Programming AAS degree.

The student should have above average communications and math skills. He/she should exhibit qualities of patience, perseverance, and preciseness, and should enjoy working in a team environment and also be able to work independently. All programs emphasize training for industry certification.

Career Opportunities
Graduates find excellent opportunities as computer programmers in business, manufacturing, government and education. Jobs for computer programmers for all types of computer systems are found throughout the country with opportunities for good earning and rapid advancement.

Program Outcomes
1. Graduates will be able to design and code production software applications.
2. Graduates will be able to use industry standard database management systems to support their applications.

Program Faculty
Warren Sheaffer
warren.sheaffer@saintpaul.edu

Program Requirements
☐ Check off when completed
This program is designed for individuals who have computer programming knowledge or are currently employed in the computer programming field.
Course               Cr
☐ CSCI 1410 Computer Science & Information Systems ......................... 4
☐ CSCI 1450 Web Fundamentals/HTML ........................................ 4
☐ CSCI 1541 Java Programming 1 ......................................... 4
☐ CSCI 1542 Java Programming 2 ......................................... 4
☐ CSCI 1550 Database Management Fundamentals ........................................ 4
☐ CSCI 2466 J2EE-JSP and Servlets ......................................... 4
Total Program Credits ........................................ 24

Program Start Dates
Fall, Spring, Summer

Course Sequence
The following sequence is recommended for a part-time student. Not all courses are offered every semester. Please contact the Program Faculty for course sequence.
First Semester
CSCI 1410 Computer Science & Information Systems ......................... 4
CSCI 1450 Web Fundamentals/HTML ........................................ 4
Total Semester Credits ........................................ 8

Second Semester
CSCI 1541 Java Programming 1 ......................................... 4
CSCI 1550 Database Management Fundamentals ........................................ 4
Total Semester Credits ........................................ 8

Third Semester
CSCI 1542 Java Programming 2 ......................................... 4
CSCI 2466 J2EE-JSP and Servlets ......................................... 4
Total Semester Credits ........................................ 8

Total Program Credits ........................................ 24

Minimum Program Entry Requirements
Students entering this program must meet the following minimum program entry requirements:
Reading: Score of 250+ or grade of “C” or better in READ 0722
Writing: Score of 250+ on Reading Comprehension or grade of “C” or better in ENGL 0922
Quant. Reasoning, Algebra & Stats: Score of 250+ or Adv. Algebra & Functions: Score of 215+ or grade of “C” or better in MATH 0910
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 MATH, READ, and ENGL courses have additional prerequisites.

Information is subject to change.
This Program Requirements Guide is not a contract.
Java Programming CERTIFICATE (continued)

(24 credits)

The below chart illustrates the courses required for completion of this certificate.
Web Based 2D Game Development CERTIFICATE

Program Overview
This is a 24 credit certificate program exploring video game creation. The certificate is ideal for students who want to acquire skills needed for game design and programming. The certificate will utilize HTML5, Javascript, Tumult Hype and Phonegap to recreate classic video games for both the Desktop and mobile platforms. The capstone class will introduce students to some of the concepts of mobile app development for both the iPhone and Android platforms. This certificate may be completed apart from a degree program or may be selected as an emphasis in the Computer Programming AAS degree.

The student should have above average communications and math skills. He/she should exhibit qualities of patience, perseverance, and preciseness, and should enjoy working in a team environment and also be able to work independently. All programs emphasize training for industry certification.

Career Opportunities
Graduates find excellent opportunities as computer programmers in business, manufacturing, government and education. Jobs for computer programmers for all types of computer systems are found throughout the country with opportunities for good earning and rapid advancement.

Program Outcomes
1. Graduates will design and code gaming software applications.
2. Graduates will apply industry standard design skills to support their applications.
3. Graduates will apply design and programming skills to non-game web projects.
4. Graduates will apply best practices for performing effective web usability tests.

Program Faculty
Darren Pearson
darren.pearson@saintpaul.edu

Program Requirements
☐ Check off when completed

This program is designed for individuals who have computer programming knowledge or are currently employed in the computer programming field.

Course
☐ CSCI 1450 Web Fundamentals/HTML ........... 4
☐ CSCI 2440 Client Side Programming 1 ........... 4
☐ DGIM 2521 2D Web Animation .................. 2
☐ DGIM 2530 Web Based Game Design 1 ........... 4
☐ DGIM 2531 Web Based Game Design 2 ........... 4
☐ DGIM 2586 Digital Sound .................... 2
☐ DGIM Technical Elective(s) .................... 4
Any 4 credits of DGIM classes will be allowed, although the following classes are recommended.
DGIM 1483 Photoshop 1 - 2cr
DGIM 1484 Photoshop 2 - 2cr
DGIM 1490 3D Animation Fundamentals - 4cr
DGIM 2560 Illustrator - 4cr

Total Program Credits ............... 24

Program Start Dates
Fall, Spring, Summer

Course Sequence
The following sequence is recommended for a part-time student. Not all courses are offered every semester. Please contact the Program Faculty for course sequence.

First Semester
CSCI 1450 Web Fundamentals/HTML ............. 4
DGIM 2521 2D Web Animation .................. 2
Total Semester Credits ..................... 6

Second Semester
CSCI 2440 Client Side Programming 1 ............. 4
DGIM Technical Electives ....................... 2
Total Semester Credits ..................... 6

Third Semester
DGIM 2530 Web Based Game Design 1 ........... 4
DGIM Technical Electives ....................... 2
Total Semester Credits ..................... 6

Fourth Semester
DGIM 2531 Web Based Game Design 2 ........... 4
DGIM 2586 Digital Sound .................... 2
Total Semester Credits ..................... 6

Total Program Credits ............... 24

Minimum Program Entry Requirements
Students entering this program must meet the following minimum program entry requirements:

Reading: Score of 250+ or grade of "C" or better in READ 0722
Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922
Quant. Reasoning, Algebra & Stats:
Score of 250+ or Adv. Algebra & Functions:
Score of 215+ or grade of "C" or better in MATH 0910

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 MATH, READ, and ENGL courses have additional prerequisites.

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

See back of this guide for Course Chart
The below chart illustrates the courses required for completion of this certificate.

**Web Based 2D Game Development CERTIFICATE (continued)**

**(24 credits)**

The below chart illustrates the courses required for completion of this certificate.

**Introductory**

- **DGIM 2521**
  - 2D Web Animation

- **CSCI 1450**
  - Web Fundamentals/HTML

**Intermediate**

- **DGIM 2530**
  - Web Based Game Design 1

- **CSCI 2440**
  - Client Side Programming

**Advanced**

- **DGIM 2531**
  - Web Based Game Design 2

*(offered once per year)*
Web Development CERTIFICATE

Program Overview
This is a 24 credit certificate program providing a foundation in current web technologies. It features a two course sequence in client side programming including AJAX, and also coverage of at least two current server side technologies for database driven development. It includes popular technologies like Ruby on Rails and JSP/Servlets. This certificate may be completed apart from a degree program or may be selected as an emphasis in the Computer Programming AAS degree.

Career Opportunities
Graduates find excellent opportunities as computer programmers in business, manufacturing, government and education. Jobs for computer programmers for all types of computer systems are found throughout the country with opportunities for good earning and rapid advancement.

Program Outcomes
1. Graduates will code production web applications based on standard client and server side technologies.
2. Graduates will employ industry standard database management systems to support their applications.
3. Graduates will create responsive, mobile friendly web applications using standard industry practices.

Program Faculty
Darren Pearson
darren.pearson@saintpaul.edu

Program Requirements
☐ Check off when completed
This program is designed for individuals who have computer programming knowledge or are currently employed in the computer programming field.

Course Cr
☐ CSCI 1410 Computer Science & Information Systems ......................... 4
☐ CSCI 1450 Web Fundamentals/HTML ........................................... 4
☐ CSCI 2440 Client Side Programming 1 ........................................... 4
☐ CSCI 2442 Server Side Programming .............................................. 4
☐ CSCI 2466 J2EE-JSP and Servlets ................................................. 4
☐ CSCI 2622 Client Side Programming 2 ........................................... 4

Total Program Credits ........................................ 24

Program Start Dates
Fall, Spring, Summer

Course Sequence
The following sequence is recommended for a part-time student. Not all courses are offered every semester. Please contact the Program Faculty for course sequence.

First Semester
CSCI 1410 Computer Science & Information Systems .................................. 4
CSCI 1450 Web Fundamentals/HTML ................................................. 4
Total Semester Credits .......................................................... 8

Second Semester
CSCI 2440 Client Side Programming 1 ................................................. 4
CSCI 2442 Server Side Programming ................................................. 4
Total Semester Credits .......................................................... 8

Third Semester
CSCI 2466 J2EE-JSP and Servlets .................................................. 4
CSCI 2622 Client Side Programming 2 ................................................. 4
Total Semester Credits .......................................................... 8

Total Program Credits ........................................ 24

See back of this guide for Course Chart

Minimum Program Entry Requirements
Students entering this program must meet the following minimum program entry requirements:

Reading: Score of 250+ or grade of "C" or better in READ 0722
Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922
Quant. Reasoning, Algebra & Stats: Score of 250+ or Adv. Algebra & Functions: Score of 215+ or grade of "C" or better in MATH 0910

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 MATH, READ, and ENGL courses have additional prerequisites.

Information is subject to change.
This Program Requirements Guide is not a contract.
Web Development  CERTIFICATE (continued)
(24 credits)

The below chart illustrates the courses required for completion of this certificate.

---

### Introductory

- **CSCI 1450**
  Web Fundamentals/HTML

- **CSCI 1410**
  Computer Science & Information Systems

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### Intermediate

- **CSCI 2440**
  Client Side Programming 1

- **CSCI 2442**
  Server Side Programming

- **CSCI 1541**
  Java Programming 1

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### Advanced

- **CSCI 2622**
  Client Side Programming 2

- **CSCI 2466**
  JSP and Servlets

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**Advanced**

(offered once per year)
Program Requirements Guide 2020 - 2021

Data Science AS DEGREE

Program Overview
Data Science uses the techniques and theories from many different fields of study including mathematics, statistics, computer science, and information theory. Data scientists sort through great amounts of unstructured data such as emails, videos, social media, and other user-generated content and write algorithms to extract insights from the data. In essence, they turn data into knowledge.

Students entering into this program of study will learn to collect, manage, interpret and analyze data in order to assist in making data-informed decisions for the benefit of a company or organization.

Career Opportunities
There is a growing need for individuals who have the skills to effectively collect and analyze data to make informed, data-driven decisions. Jobs for data scientists, business intelligence analysts, data mining analysts and other data science professions have emerged across all industries that use data extensively, including government, business, healthcare, online commerce and more.

Program Outcomes
1. Graduates will have knowledge and skills to understand big data and the challenges of capturing, storing and retrieving massive data.
2. Graduates will develop an understanding of the analytical and computational techniques used to analyze data for the purposes of providing meaning.
3. Graduates will be familiar with the foundations, frameworks and applications of the emerging field of data science.
4. Graduates of the Data Science program will be prepared for the application of database analytical approach to identify and solve problems.

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 saintpaul.edu/Transfer.

Data Science AS
BA Individualized Studies
Metropolitan State University

Program Faculty
Warren Sheaffer
warren.sheaffer@saintpaul.edu

Program Requirements
☐ Check off when completed
Course       Cr
☐ CSCI 1410 Computer Science & Information Systems  ................. 4
☐ CSCI 1523 Intro to Computing and Programming Concepts  ........... 4
☐ CSCI 1524 Intro to Algorithms and Data Structures  ................. 4
☐ CSCI 1541 Java Programming 1  ......... 4
☐ CSCI 1550 Database Management Fundamentals  .................... 4
☐ CSCI 1714 Introduction to Data Science  ............. 4
☐ Technical Electives  ................................ 6
Select from CSCI, GISC, MATH, the following are recommended:
CSCI 1450 Web Fund/HTML - 4 cr
CSCI 1544 Enterprise Op Systems - 4 cr
CSCI 2470 Enterprise Database Systems - 4 cr
GISC 1760 Intro to GIS - 4 cr
GISC 1765 Cartography - 3 cr
GISC 2730 Programming and Scripting in GIS - 4 cr
MATH 2749 Calculus 1 - 4 cr
Subtotal: ........................................ 30

General Education/MnTC Requirements Cr
Refer to the Minnesota Transfer Curriculum Course List for each Goal Area
☐ Goal 1: Communication  ................. 7
ENGL 1711 Composition 1 - 4 cr
COMM 17XX - 3 cr
☐ Goal 4: Mathematical/Logical Reasoning  ......... 11
MATH 1740 Introduction to Statistics - 4 cr
MATH 2100 Intermediate Statistics - 4 cr
PHIL 1710 Logic - 3 cr
☐ Goal 5: History, Social Science and Behavioral Sciences  ............ 3
ECON 1720 Macroeconomics - 3 cr OR
ECON 1730 Microeconomics - 3 cr
☐ Goal 6: Humanities & Fine Arts  ............... 3
PHIL 1720 Ethics - 3 cr
☐ Goals 1-10 of the Minnesota Transfer Curriculum  ................. 6
Students must select a minimum of 5 additional credits such that courses from at least six (6) goal areas of the Minnesota Transfer Curriculum are met.
General Education Requirements  .................. 30
Total Program Credits  .................. 60

Program Start Dates
Fall, Spring, Summer

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
CSCI 1410 Computer Science & Information Systems  ................. 4
Goal 1: ENGL 1711 Composition 1  ............ 4
Goal 2: COMM 17XX  .................. 3
Goal 4: PHIL 1710 Logic  ................. 3
Total Semester Credits  .................. 14

Second Semester
CSCI 1523 Intro to Computing and Programming Concepts  .......... 4
CSCI 1550 Database Management  .......... 4
Goal 4: MATH 1740 Introduction to Statistics  ................. 4
Goal 5: ECON 1720 Macroeconomics  ........ 3
OR ECON 1730 Microeconomics  ........ 3
Total Semester Credits  .................. 15

Third Semester
CSCI 1541 Java Programming 1  ............. 4
CSCI 1714 Introduction to Data Science  ............. 4
Goal 4: MATH 2100 Intermediate Statistics  ................. 4
Goal 6: PHIL 1720 Ethics  ................. 3
Total Semester Credits  .................. 15

Fourth Semester
CSCI 1524 Intro to Algorithms and Data Structures  ............. 4
Technical Electives  ................................ 6
MnTC Electives  ................................ 6
Total Semester Credits  .................. 16
Total Program Credits  .................. 60

Minimum Program Entry Requirements
Students entering this program must meet the following minimum program entry requirements:

Reading: Score of 250+ on grade of “C” or better in READ 0722
Writing: Score of 250+ on Reading Comprehension or grade of “C” or better in ENGL 0922
Quant. Reasoning, Algebra & Stats: Score of 270+ or Adv. Algebra & Functions: Score of 250+ 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 MATH, READ, and ENGL courses have additional prerequisites.

Information is subject to change.
This Program Requirements Guide is not a contract.
Program Overview
GIS is an acronym for Geographic Information Science. The GIS Associate of Applied Science degree will prepare students for entry level positions in various industries that require geospatial skills and thinking or for transitioning to four-year baccalaureate programs. Students completing this degree will be able to create and import digital special data representing real-world features from the surface of the Earth with the goal of viewing, manipulating, and analyzing the data to be distributed and used in decision making.

Duties for many positions requiring GIS skills typically involve a combination of outside field work and indoor computer work. While outside, raw spatial data is often collected with GPS devices for a variety of features. Some examples include the location of trees, fountains, utility poles, underground pipelines, soil sample sites, endangered species, and more. The working environment may be in a dense urban area or remote national park, depending on the employer. While inside, digital special data are imported from your GPS devices into a computer where the data is assessed for quality and revised/manipulated if necessary. Remotely sensed data from various sensors and online archives may also be used to generate additional information. GIS employees typically coordinate with other experts (e.g., geologists, business operations specialists, hydrologists, farmers, and urban planners) to discuss the scientific and managerial implications of their work.

Career Opportunities
There are abundant opportunities for employment as a GIS Analyst, GIS Technician, or GIS Specialist in a wide variety of businesses, universities, government agencies, and non-profit organizations. Employees with strong GIS skills are highly coveted in the oil and gas industry, biological and environmental sciences research, natural resource management, government agencies focus on mapping and analyzing infrastructure, intelligence collection by federal agencies, and various business groups. GIS professionals also have ample opportunity to advance into more highly-skilled positions or managerial and leadership positions.

Program Outcomes
1. Graduates will possess fundamental and applied skills in GIS such as making maps, working with rasters and vectors, geometric accuracy, georeferencing, map projections, spatial analysis, Boolean logic, scripting, remote sensing, air photo interpretation, etc.
2. Graduates will develop a working knowledge of the most popular GIS software, ArcGIS from ESRI.
3. Graduates will develop a working knowledge of GPS devices used by a multitude of businesses and government agencies.

Program Requirements
- Check off when completed

Course
- GISC 1760 Introduction to GIS ............... 4
- GISC 1765 Cartography .................................. 3
- GISC 1770 Spatial Thinking ........................... 3
- GISC 1775 Intro to Remote Sensing ............ 4
- GISC 1780 Spatial Analysis ......................... 3
- GISC 1785 GPS Field Techniques .................. 3
- GISC 2720 Web-based GIS .......................... 3
- GISC 2725 Object-based Image Analysis ........ 3
- GISC 2730 Programming and Scripting in GIS .. 4
- Subtotal .................................................. 30

General Education/MnTC Requirements
- Refer to the Minnesota Transfer Curriculum Course List for each Goal Area
- Goal 1: Communication ................................. 7
- ENGL 1171 Composition 1 − 4 cr
- COMM 17XX − 3 cr
- Goal 3: Natural Sciences ............................... 4
- BIOL 1725 Environmental Science
- Goal 4: Mathematical/Logical Reasoning ....... 4
- MATH 1740 Introduction to Statistics
- Goal 5: History, Social Science and Behavioral Sciences .......................... 3
- GEOG 1700 Physical Geography
- Goal 6: Humanities and Fine Arts ................... 3
- Goals 1-10 of the Minnesota Transfer Curriculum ........................................... 9
- General Education Requirements ................. 30

Total Program Credits ................................. 60

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 saintpaul.edu/Transfer.

Geographic Information Science AAS
BA Individualized Studies
Metropolitan State University

Program Faculty
Kirk Stueve
kirk.stueve@saintpaul.edu

Program Start Dates
Fall, Spring, Summer
– only General Education courses & GISC 1785

Course Sequence
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
- GISC 1760 Introduction to GIS ................. 4
- GISC 1765 Cartography ............................... 3
- GISC 1770 Spatial Thinking ......................... 3
- Goal 1: COMM 17XX ............................... 3
- Goal 5: GEOG 1700 Physical Geography ........ 3
- Total Semester Credits ................................. 16

Second Semester
- GISC 1775 Intro to Remote Sensing ............ 4
- GISC 1780 Spatial Analysis .......................... 3
- GISC 1785 GPS Field Techniques (summer only) .... 3
- Goal 4: MATH 1740 Introduction to Statistics .... 4
- Total Semester Credits ................................. 14

Third Semester
- GISC 2720 Web-based GIS .......................... 3
- GISC 2725 Object-based Image Analysis .......... 3
- Goal 1: ENGL 1171 Composition 1 .............. 4
- Goal 6: Humanities and Fine Arts ................. 3
- MnTC Elective ........................................... 3
- Total Semester Credits ................................. 16

Fourth Semester
- GISC 2730 Programming and Scripting in GIS .. 4
- Goal 3: BIOL 1725 Environmental Science .... 4
- MnTC Elective ........................................... 6
- Total Semester Credits ................................. 14
- Total Program Credits ................................. 60

Minimum Program Entry Requirements
Students entering this program must meet the following minimum program entry requirements:
- Reading: Score of 250+ or grade of “C” or better in READ 0722
- Writing: Score of 250+ on Reading Comprehension or grade of “C” or better in ENGL 0922
- Quant. Reasoning, Algebra & Stats: Score of 270+ or Adv. Algebra & Functions: Score of 250+ 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 MATH, READ, and ENGL courses have additional prerequisites.

Information is subject to change.
This Program Requirements Guide is not a contract.
Program Overview
In order to be admitted to the Geographic Information Science certificate program, the student must have completed an associate degree or baccalaureate degree, or receive instructor approval if currently pursuing an associate degree in another discipline.

The Geographic Information Science certificate program is designed to introduce students to fundamental concepts in GIS and prepare them for entry level positions in various industries that require some knowledge and understanding of GIS. Students completing the GIS certificate program will learn how to solve problems and support the decision making process by collecting, viewing, manipulating, and mapping digital spatial data. There will be ample opportunities in the classes for students to pursue independent GIS projects related to their interests.

Career Opportunities
Duties for most positions requiring skills obtained from the GIS Certificate program are highly variable. Some employees spend much of their time working in an office with cutting-edge GIS software, but others are outside in the field most of the time providing support for data collection activities. For instance, in a retail setting, employees may provide technical insight for modeling the most appropriate location of new stores based on a variety of variables such as distance to existing stores, population density, and demographics. In an environmental science setting, employees may identify and map locations of invasive species or provide support in developing a watershed analysis geared to improve water quality.

Most employment opportunities relevant to the GIS Certificate will be listed under a wide range of specialties in various sectors (e.g., environment field technician, business support analyst, computer programmer, etc.) where GIS is not mentioned in the title, but is a preferred skill. The opportunity you are best suited for will be shaped by your previous and ongoing education and work experience.

Program Outcomes
1. Basic skills for working with digital spatial data in a GIS environment. This includes a fundamental understanding of rasters, vectors, map projections, coordinate systems, and cartography.
2. Solid understanding of ArcGIS from ESRI.
3. Working knowledge of Trimble GPS units.

Program Faculty
Kirk Stueve
kirk.stueve@saintpaul.edu

Program Requirements
- Check off when completed
- Course  Cr
  - GISC 1760 Introduction to GIS ............... 4
  - GISC 1765 Cartography .................... 3
  - GISC 1770 Spatial Thinking ................. 3
  - GISC 1785 GPS Field Techniques .......... 3
  - Subtotal ................................ 13

Total Program Credits ................. 13

Program Start Dates
Fall, Spring, Summer
– only GISC 1785

Course Sequence
Not all courses are offered each semester; a selection of courses is offered summer term.
Students should consult with the Program Faculty each semester.
Program is not eligible for financial aid.

First Semester
GISC 1760 Introduction to GIS ................. 4
GISC 1765 Cartography .......................... 3
GISC 1770 Spatial Thinking ..................... 3
GISC 1785 GPS Field Techniques (summer only) ............ 3

Total Semester Credits ..................... 13
Total Program Credits ..................... 13

Minimum Program Entry Requirements
Students entering this program must meet the following minimum program entry requirements:

Note: Students must have completed an Associate Degree or Baccalaureate degree or have instructor approval to be enrolled in this Certificate.

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 MATH, READ, and ENGL courses have additional prerequisites.