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

Science, Mathematics

Science

Mathematics

Science, Technology, Engineering

Science

Engineering

Mathematics

Computer Graphics and Visualization

Computer Science

Data Science

Course delivery methods change on a semester basis. Please check the current course schedule for the most up-to-date information at saintpaul.edu/CourseSchedule.

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, immunochemistry, 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.

Course			Cr
BIOC	1790	Special Topics in Biochemistry	1-6
BIOC	2700	Biochemistry	4
BIOC	2790	Biochemistry Internship/Research Project	1-4

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.

Course			Cr
BIOL	1471	Medical Terminology	2
BIOL	1725	Environmental Science	4
BIOL	1730	Human Body Systems	3
BIOL	1735	Understanding Biology	4
BIOL	1740	General Biology 1: The Living Cell	5
BIOL	1745	General Biology 2: The Living World	5
BIOL	1755	Research Fundamentals	3
BIOL	1760	Nutrition	3
BIOL	1782	Introduction to Forensic Science	4
BIOL	1785	Biology of Women	3
BIOL	1790	Special Topics in Biology	1-6
BIOL	2721	Human Anatomy and Physiology 1	4
BIOL	2722	Human Anatomy and Physiology 2	4
BIOL	2750	General Microbiology	4
BIOL	2755	Genetics	4
BIOL	2760	Cell and Molecular Biology	5
BIOL	2770	Biology Internship	1-4
BIOL	2790	Research Project for Science and Engineering Technology	1-4

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 1755	Research Fundamentals	3
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 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

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 2240	Statistics for Psychology/Behavioral Sciences	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

Biology Transfer Pathway AS DEGREE

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
Refer to the Minnesota Transfer Curriculum Course List for each Goal Area	
☐ Goal 1: Communication	9
ENGL 1711 Composition 1 – 4 cr	
ENGL 1712 Composition 2 – 2 cr	
COMM 17XX – 3cr	
☐ 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**

Transfer Opportunities

Saint Paul College has transfer agreements & partnerships between many post-secondary institutions. For more information please go to saintpaul.edu/Transfer.

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 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**

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

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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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.

TPBI

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.

Transfer Opportunities

Saint Paul College has transfer agreements & partnerships between many post-secondary institutions. For more information please go to saintpaul.edu/Transfer.

Program Faculty

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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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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.

TPCH

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
   a. Speak clearly, loudly, and to the appropriate level of the audience
   a. Address or answer audience questions

   ASSESSMENT TOOLS
   a. Formal lab project rubric

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. Follow lab safety and waste management protocols

   ASSESSMENT TOOLS
   a. Project in CHEM 1711 rubric

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 cr	
ENGL 1712 Composition 2 – 2 cr	
COMM 17XX – 3 cr	
☐ Goal 3: Natural Science	0
Met with courses from above.	
☐ Goal 4: Mathematical/Logical Reasoning	8
MATH 2749 Calculus 1 – 4 cr	
MATH 2750 Calculus 2 – 4 cr	
☐ 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**

See back of this guide for Program Start Dates & Course Sequence

Information is subject to change.
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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

Science and Engineering Technology AS DEGREE

Program Overview

The Science and Engineering Technology degree is designed for students who are seeking employment in a science laboratory and/or who are seeking to transfer to a four-year program.

Career Opportunities

Science and Engineering Technicians and Technologists work in many aspects of the laboratory industry from basic research to clean room facilities. They work in a variety of sub-fields, such as biotechnology, microbiology, nanotechnology, pharmaceutical research, chemical technology, science manufacturing, and materials engineering. Technicians operate many kinds of equipment and instrumentation, prepare samples for processing, monitor commercial production, test for product quality, and collect and analyze samples. They conduct a variety of laboratory procedures, from routine laboratory procedures to complex research projects. Students in this program take core courses in research and instrumentation and chose one of the three specialized tracks; biology, chemistry, or engineering. A solid background in science and math along with the skills in using advanced equipment is vital for success as a Science and Engineering Technician or Technologist.

Program Outcomes

1. Design and conduct experiments as well as analyze and interpret the results.
2. Operate and safely use instrumentation in science and engineering laboratories.
3. Act professionally and with ethical responsibility.
4. Communicate the results of experiments using appropriate mathematical, scientific, and engineering principles.
5. Solve science technology problems within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

Transfer Opportunities

Saint Paul College has transfer agreements & partnerships between many post-secondary institutions. For more information please go to saintpaul.edu/Transfer.

Information is subject to change.
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Program Faculty

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Program Requirements

☑ Check off when completed

Science and Engineering Core: Required

Course	Cr
☐ BIOL/CHEM 1755 Research Fundamentals	3
☐ CHEM 2730 Instrumental Analysis	4
☐ BIOL/CHEM/ENGR 2790 Research Project for Science and Engineering Technology	3
Subtotal	**10**

Science and Engineering Focus (Select one focus area)

Chemistry

☐ CHEM 1712 Principles of Chemistry 2	4
☐ CHEM 2720 Organic Chemistry 1	5
☐ CHEM 2721 Organic Chemistry 2	5
☐ Science or Engineering Electives	6

Biology

☐ BIOL 1740 General Biology 1	5
☐ BIOL 2750 Microbiology	4
☐ BIOL 2755 Genetics	4
☐ Science or Engineering Electives	7

Engineering

☐ ENGR 1707 Introduction to Engineering	3
☐ PHYS 1720 or 2700 Principles of Physics 1 OR General Physics 1	4-5
☐ PHYS 1722 Principles of Physics 2 OR 2710 General Physics 2	4-5
☐ Science or Engineering Electives	7-9
Focus Subtotal	**20**

Note: Science/engineering electives must be taken from: BIOC, BIOL, CHEM, CSCI, ENGR, NSCI, PHYS. Consult with your advisor for information about 2, 3, and 4 credit course options.

General Education/MnTC Requirements	Cr
Refer to the Minnesota Transfer Curriculum Course List for each Goal Area	
☐ Goal 1: Communication ENGL 1711 Composition 1 – 4 cr COMM 17XX – 3 cr	7
☐ Goal 3: Natural Science CHEM 1711 Principles of Chemistry 1 – 4 cr	4
☐ Goal 4: Mathematical/Logical Reasoning	7
☐ Goal 5: History, Social Science and Behavioral Sciences	3
☐ Goal 6: Humanities and Fine Arts	3
☐ Goals 1-10 of the Minnesota Transfer Curriculum	6
Students must select a minimum of 6 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

See back of this guide for Program Start Dates & Course Sequence

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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Science and Engineering Technology 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 1 4
Goal 3: CHEM 1711 Principles of Chemistry 1 4
Goal 4: MATH XXXX 3-4
Goal 5: History, Social Science and Behavioral Sciences 3
Total Semester Credits 14-15

Second Semester

Goal 4: MATH XXXX 3-4
MnTC Elective: ENGL 1712 Composition 2 (Recommended) 2
Chemistry Focus:
- CHEM 1712 Principles of Chemistry 2 4
- Goal 6: Humanities and Fine Arts 3

Biology Focus:
- BIOL 1740 General Biology 1 5
- Goal 6: Humanities and Fine Arts 3

Engineering Focus:
- PHYS 1720/2700 Physics 1 4-5
- ENGR 1707 Introduction to Engineering 3

MnTC Elective 4
Total Semester Credits 16-18

Third Semester

BIOL/CHEM 1755 Research Fundamentals 3
Goal 1: COMM 17XX 3
Chemistry Focus:
- CHEM 2720 Organic Chemistry 1 5
- Science or Engineering Electives 3-4

Biology Focus:
- BIOL 2755 Genetics 4
- Science or Engineering Electives 3-4

Engineering Focus:
- PHYS 1722/2710 Physics 2 4-5
- Science or Engineering Electives 3

Total Semester Credits 13-15

Fourth Semester

Goal 3: CHEM 2730 Instrumental Analysis 4
Goal 3: BIOL/CHEM/ENGR 2790 Research Project for Science and Engineering Technology 3
Chemistry Focus:
- CHEM 2721 Organic Chemistry 2 5
- Science or Engineering Electives 3

Biology Focus:
- BIOL 2750 Microbiology 4
- Science or Engineering Electives 3-4

Engineering Focus:
- Science or Engineering Electives 4-6
- Goal 6: Humanities and Fine Arts 3

Total Semester Credits 14-16

Total Program Credits 60

Scientific Research CERTIFICATE

Program Overview

This program is an excellent resume-building program, and gives students skills they can use for immediate employment in scientific industries or as a requirement for professional schools. Students in this program take core courses in research and obtain a solid background in science. Students do a semester long undergraduate research project with a faculty and/or industry mentor to gain unique hands-on experience.

Career Opportunities

Science and Engineering Technicians and technologists work in many aspects of the laboratory industry. They work in a variety of sub-fields, such as biotechnology, microbiology, nanotechnology. pharmaceutical research, chemical technology, science manufacturing, and materials engineering.

Technicians and technologists operate equipment and instrumentation, prepare samples for processing, monitor commercial production, test for product quality, and collect and analyze samples. They conduct a variety of laboratory procedures, from routine laboratory procedures to complex research projects.

Program Outcomes

1. Use appropriate scientific tools to design and conduct experiments and analyze results.
2. Communicate the results of experiments using appropriate scientific principles.
3. Solve science technology problems within real industrial constraints.
4. Act professionally and with ethical responsibility.

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

Program Faculty

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Program Requirements

☑ Check off when completed

Science and Engineering Core: Required

Course	Cr
☐ CHEM 1711 Principles of Chemistry 1	4
☐ BIOL/CHEM 1755 Research Fundamentals	3
☐ BIOL/CHEM/ENGR 2790 Research Project for Science and Engineering Technology	3
Subtotal	**10**

Science and Engineering Focus

Students should choose their remaining courses from the list below to achieve a total of 16 credits for the certificate.

☐ **Chemistry**

CHEM 1712 Principles of Chemistry 2	4
CHEM 2720 Organic Chemistry 1	5
CHEM 2721 Organic Chemistry 2	5
CHEM 2730 Instrumental Analysis	4

☐ **Biology**

BIOL 1740 General Biology 1	5
BIOL 2750 Microbiology	4
BIOL 2755 Genetics	4

☐ **Engineering**

ENGR 1707 Introduction to Engineering	3
PHYS 1720 Principles of Physics 1 OR 2700 General Physics 1	4-5
PHYS 1722 Principles of Physics 2 OR 2710 General Physics 2	4-5

Total Program Credits 16

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

CHEM 1711 Principles of Chemistry 1	4
BIOL/CHEM 1755 Research Fundamentals	3

Second Semester

BIOL/CHEM/ENGR 2790 Research Project for Science and Engineering Technology	3-4
BIOL/CHEM/ENGR Electives	5-6

Total Program Credits 16

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.

396C

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 and science in the solution of problems.
2. Conduct experiments as well as analyze and interpret results from experiments.
3. Apply iterative engineering design process to formulate, test and revise solutions to open-ended problems.

Transfer Opportunities

Saint Paul College has transfer agreements & partnerships between many post-secondary institutions. For more information please go to saintpaul.edu/Transfer.

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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

Adv. Algebra & Functions: Score of 276+

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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Program Faculty

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

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

Integrated

☐ 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 ENGL 1711 Composition 1 – 4cr	4
☐ Goal 3: Natural Sciences CHEM 1711 Principles of Chemistry 1 – 4 cr PHYS 2700 General Physics 1 – 5 cr PHYS 2710 General Physics 2 – 5 cr	14
☐ Goal 4: Mathematical/Logical Reasoning 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	16
☐ Goal 5: History, Social Science and Behavioral Sciences	3
☐ Goal 6: Humanities and Fine Arts. *The course selected for goal area 5 or 6 must also satisfy goal 7, 8, 9, or 10.	3
General Education Requirements	**40**
Total Program Credits	**60**

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

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

ENGR 1707 Introduction to Engineering	3
Goal 1: ENGL 1711 Composition 1	4
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 4: MATH 2750 Calculus 2	4
Goal 5: History, Social Science and Behavioral Sciences	3
Total Semester Credits	**16**

Third Semester

ENGR 2705 Statics	3
Goal 3: PHYS 2710 General Physics 2	5
Goal 4: MATH 2760 Differential Equations & Linear Algebra (fall only)	4
Goal 6: Humanities and Fine Arts	3
Total Semester Credits	**15**

Fourth Semester

ENGR 1717 Circuit Analysis	4
ENGR 2710 Dynamics	3
ENGR 2712 Deformable Body Mechanics	3
Goal 4: MATH 2753 Multivariable Calculus (spring only)	4
Total Semester Credits	**14**

Total Program Credits **60**

Associate of Arts DEGREE
Mathematics Transfer Pathway

Program Overview

The Mathematics Transfer Pathway AA degree will prepare students for transfer to a baccalaureate program of study in a variety of mathematics fields. It lays a solid foundation for programs that include: applied mathematics, actuarial science, biomathematics, computer science, data science, engineering, pure/theoretical mathematics, statistics, and mathematics education.

Career Opportunities

Upon completion of the Math Transfer Pathway AA degree, students will have developed strong critical thinking, quantitative reasoning, computational, and analytical skills. They will be prepared to major or minor in a variety of fields that include: applied mathematics, actuarial science, biomathematics, computer science, data science, engineering, pure/theoretical mathematics, statistics, and mathematics education. With a degree in any of the areas mentioned above, they will have a variety of employment opportunities in government, private industry, and education.

Program Outcomes

1. Develop and analyze mathematical models.
2. Apply logical reasoning to solve a variety of problems.
3. Construct and verify simple mathematical proofs.
4. Navigate multiple perspectives through an attitude of respectful interest and curiosity by engaging in problem solving and discussion with a diverse group of students in mathematics.

Transfer Opportunities

Saint Paul College has transfer agreements & partnerships between many post-secondary institutions. For more information please go to saintpaul.edu/Transfer.

Program Faculty

Sarah Cooley sarah.cooley@saintpaul.edu
Sasha Goftarsh sasha.goftarsh@saintpaul.edu
Francois Nguyen francois.nguyen@saintpaul.edu
Kristin Pueringer kristin.pueringer@saintpaul.edu
Avani Shah avani.shah@saintpaul.edu
Ba Su ba.su@saintpaul.edu
Natalya Taylor natalya.taylor@saintpaul.edu

Program Requirements

☑ Check off when completed

Pathway Requirements	Cr
☐ MATH 2749 Calculus 1	4
☐ MATH 2750 Calculus 2	4
☐ MATH 2753 Multivariable Calculus1	4
☐ MATH 2760 Differential Equations and Linear Algebra	4
☐ Pathway Electives. Any MnTC course may be counted however; MATH 2460 Discrete Mathematics – 4 cr is recommended	4
Pathway Total	**20**

MnTC Requirements	Cr
Refer to the Minnesota Transfer Curriculum Course List for each Goal Area	
☐ Goal 1: Communication ENGL 1711 Composition 1 – 4 cr ENGL 1712 Composition 2 – 2 cr COMM 17XX- 3 cr	9
☐ Goal 2: Critical Thinking *Fulfilled when 10 goal areas (40 credits) are completed.*	
☐ Goal 3 Natural Science *Two courses from two different disciplines, one of which must be a lab course.*	7
☐ Goal 4: Mathematical/Logical Reasoning *One course numbered between 1700-1799 or 2700-2799. Met with Pathway MATH courses.*	3
☐ Goal 5: History, Social Sciences and Behavioral Sciences *Three courses from two different disciplines.*	9
☐ Goal 6: Humanities & Fine Arts. *Three courses from two different disciplines.*	9
☐ Goal Areas 7-10 *Select courses to meet all 10 Goal Areas*	
MnTC Requirements Total	**40**

Total Program Credits 60

If courses are counted in both the Pathway Requirements and the MnTC Requirements students may need to complete additional classes to reach the 60 credit total.

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

Program Advisors

Pathway Advisors are the Academic Advisors for the Associate of Arts degree and are located in the Advising Center, Room 1340, Main Floor. For assistance or additional information, please call our Advising Center at 651.846.1739 or email: advising@saintpaul.edu

Additional Requirements

- At least 60 earned college-level credits (40 MnTC credits and 20 additional MnTC, pre-major or elective credits)
- A grade of "C" or better in ENGL1711
- Associate of Arts (AA) cumulative GPA of 2.0
- Minnesota Transfer Curriculum (MnTC) cumulative GPA of 2.0
- Meet Saint Paul College residency requirement: 20 credits. This requirement may be reduced to 12 credits with transfer of at least 12 college-level credits from another Minnesota State College and University or the University of Minnesota.

Program Start Dates

Fall, Spring, Summer

Course Sequence

Students are allowed to take the courses in any sequence. However, all course prerequisites need to be followed. For specific suggestions, please speak with a Pathway Advisor or the program faculty. Students should consult with the Program Advisor each semester.

Not all courses are offered each semester, a selection of courses is offered summer term.

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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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.

TPMA

Computer Graphics and Visualization AS 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 preciseness, and should enjoy working 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.

Transfer Opportunities

Saint Paul College has transfer agreements & partnerships between many post-secondary institutions. 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	Cr
☐ 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 Any 6 credits in DGIM or CSCI	6
Subtotal	**30**

General Education/MnTC Requirements	Cr
Students must select courses from at least six (6) different Goal Areas of the MnTC. Refer to the Minnesota Transfer Curriculum Course List for each Goal Area	
☐ Goal 1: Communication ENGL 1711 Composition 1 – 4 cr COMM 17XX – 3 cr	7
☐ Goal 4: Mathematical/Logical Reasoning	3
☐ Goal 5: History, Social Science and Behavioral Sciences	4
☐ Goal 6: Humanities and Fine Arts. ARTS 1713 Photography 1 – 3 cr (recommended)	7
☐ Goals 1-10 of the Minnesota Transfer Curriculum Select a minimum of 9 additional credits	9
General Education Requirements	**30**

Total Program Credits 60

Program Start Dates

Fall, Spring, Summer

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

Course Sequence

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

First Semester

CSCI 1450 Web Fundamentals/HTML	4
DGIM 1400 Introduction to Computer Graphics (fall only)	4
DGIM 1443 Graphical Web Design 1	2
Goal 1: ENGL 1711 Composition I	4
Goal 1: COMM 17XX	3
Total Semester Credits	**17**

Second Semester

DGIM 1448 Adobe Animate 1	2
DGIM 1483 Photoshop 1	2
DGIM 1484 Photoshop 2	2
DGIM 1540 Blogging Applications (spring only)	2
Goal 5: History, Social Science and Behavioral Sciences	4
Goal 6: Humanities and Fine Arts	3
Total Semester Credits	**15**

Third Semester

DGIM 1480 InDesign	2
DGIM 2586 Digital Sound (fall only)	2
Goal 4: Mathematical/Logical Reasoning	3
Goal 6: Humanities and Fine Arts	4
Technical Electives	2
Total Semester Credits	**13**

Fourth Semester

DGIM 2587 Digital Video 1	2
MnTC Electives	9
Technical Electives	4
Total Semester Credits	**15**

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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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.

255S

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 transfer agreements & partnerships between many post-secondary institutions. For more information please go to saintpaul.edu/Transfer.

Program Faculty

Darren Pearson

darren.pearson@saintpaul.edu

Recommended Equipment

USB Drive, Digital Camera, Adobe Software

Estimated Book Cost

$50 - $75 per class

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

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 Any 4 credits in DGIM or CSCI; ensure technical elective is not part of selected emphasis	4
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 ENGL 1711 Composition 1 – 4 cr COMM 17XX – 3 cr	7
☐ Goal 4: Mathematics/Logical Reasoning MATH 1730 College Algebra – 3 cr OR PHIL 1710 Logic – 3 cr	3
☐ Goal 5: History, Social Science and Behavioral Sciences	3
☐ Goal 6: Humanities and Fine Arts	3
☐ Goals 1-10 of the Minnesota Transfer Curriculum Select a minimum of 4 additional credits	4
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.

First Semester

CSCI 1450 Web Fundamentals/HTML	4
DGIM 1400 Introduction to Computer Graphics (fall only)	4
DGIM 1448 Adobe Animate 1	2
DGIM 1449 Adobe Animate 2	2
Goal 1: ENGL 1711 Composition I	4
Total Semester Credits	**16**

Second Semester

DGIM 2587 Digital Video 1 (spring only)	2
DGIM 2588 Digital Video 2 (spring only)	2
Goal 1: COMM 17XX	3
Goal 5: History, Social and Behavioral Sciences	3
Emphasis Course	4
Total Semester Credits	**14**

Third Semester

DGIM 2560 Illustrator (fall only)	4
DGIM 2569 Digital Portfolio Development	2
Goal 4: MATH 1730 College Algebra OR PHIL 1710 Logic	3
Emphasis Course	4
Technical Elective(s)	4
Total Semester Credits	**17**

Fourth Semester

DGIM 1480 InDesign	2
Goal 6: Humanities and Fine Arts	3
MnTC Electives	4
Emphasis Course	4
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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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. 215A

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 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** Any DGIM or CSCI	**4**
☐ **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.

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 (fall only)	4
DGIM 1443 Graphical Web Design 1	2
DGIM 2560 Illustrator (fall only)	4
Total Semester Credits	**10**

Second Semester

DGIM 1448 Adobe Animate 1	2
DGIM 1483 Photoshop 1	2
Technical Electives	4
Goal 6: ARTS 17XX recommended	3
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.

289C

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 (Select any 2 credits in DGIM not already required for this program)	2
Total Program Credits	**18**

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

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 (Select any 2 credits in DGIM not already required for this program)	2
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.

336C

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**

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

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 1448 Adobe Animate 1	2
DGIM 2521 2D Web Animation	2
Total Semester Credits	**8**

Second Semester

CSCI 2440 Client Side Programming 1 (spring only)	4
DGIM 1443 Graphical Web Design 1	2
CSCI 1470 Web Design (spring only)	4
Total Semester Credits	**10**

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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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.

178C

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. Analyze multiple sources of network data to identify a security incident.
2. Troubleshoot hardware and software problems in a network environment.
3. Determine whether a computer system complies with national security standards.
4. Describe and identify password policies.
5. Install and configure basic host and network security.

Transfer Opportunities

Saint Paul College has transfer agreements & partnerships between many post-secondary institutions. For more information please go to saintpaul.edu/Transfer.

Program Faculty

Mark Rawlings
mark.rawlings@saintpaul.edu

Program Requirements

☑ Check off when completed

Course	Cr
☐ CSCI 1410 Computer Science & Information Systems	4
☐ CSCI 1440 Networking Fundamentals	4
☐ CSCI 1475 A+ Hardware/Operating System Prep OR CSCI 1423 Computer Networking 1 - Client	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 ENGL 1711 Composition 1 – 4 cr COMM 17XX – 3 cr	7
☐ Goal 3 or Goal 4 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. (PHIL 1720 Ethics is recommended)	3
General Education Requirements	**16**

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
CSCI 1440 Networking Fundamentals 4
CSCI 1475 A+ Hardware/Operating System Prep OR CSCI 1423 Computer Networking 1 - Client 4
Goal 1: ENGL 1711 Composition 1. 4
Total Semester Credits. 16

Second Semester

CSCI 2420 Computer Security 4
CSCI 2461 Computer Networking 3 – Linux. 4
CSCI 2465 Computer Networking 4 – Infrastructure 4
Goal 1: COMM 17XX 3
Total Semester Credits. 15

Third Semester

CSCI 1523 Intro to Computing and Programming Concepts 4
CSCI 2482 Security and Incident Handling Response and Disaster Recovery (fall only) 4
Goal 3: Natural Sciences OR Goal 4: Mathematical /Logical Reasoning 3
(MATH 1730 or proficiency required)
Goal 5: History, Social Science and Behavioral Sciences 3
Total Semester Credits. 14

Fourth Semester

CSCI 2480 Network Security and Penetration Prevention (spring only) 4
CSCI 2484 Ethical Hacking and Countermeasures (spring only). 4
CSCI 2570 Machine Architecture and Organization 4
Goal 6: Humanities and Fine Arts 3
(PHIL 1720 Ethics is recommended)
Total Semester Credits. 15

Total Program Credits 60

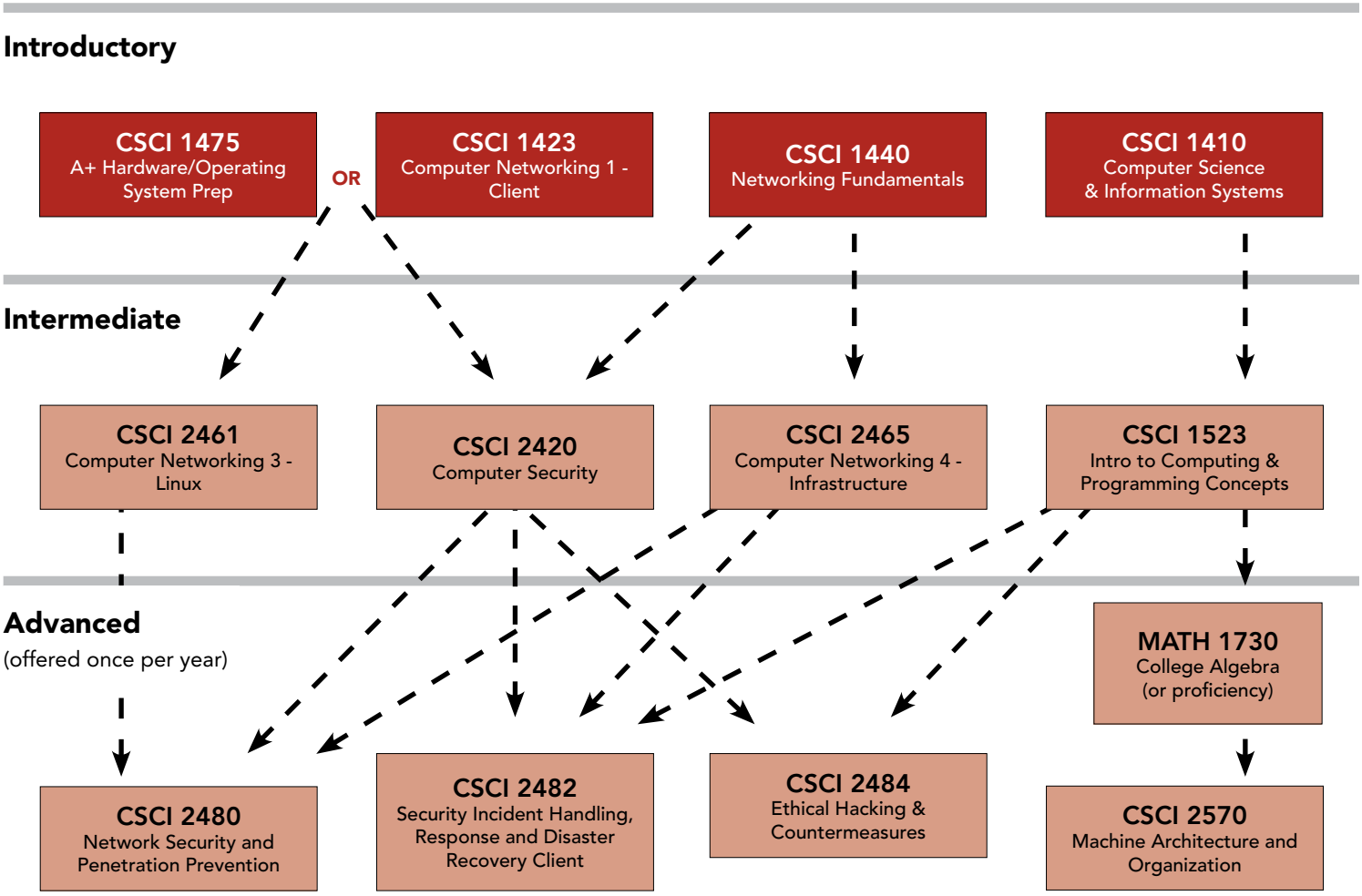
See back of this guide for Course Chart

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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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.

352A

CyberSecurity CERTIFICATE

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. Analyze multiple sources of network data to identify a security incident.
2. Determine if a computer system complies with national security standards.
3. Troubleshoot hardware and software problems in a network environment.
4. Describe and identify password policies.
5. Install and configure basic host and network security.

Program Faculty

Mark Rawlings
mark.rawlings@saintpaul.edu

Program Requirements

☑ Check off when completed

Course	Cr
☐ 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
Subtotal	**24**
Total Program Credits	**24**

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

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 2482 Security and Incident Handling Response and Disaster Recovery (fall only)	4
Total Semester Credits	**12**

Second Semester

CSCI 2451 Computer Networking 2 - Server	4
CSCI 2480 Network Security and Penetration Prevention (spring only)	4
CSCI 2484 Ethical Hacking & Countermeasures (spring only)	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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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.

352C

Computer Science Transfer Pathway AS DEGREE

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 develop and implement complex algorithms in computer-programming languages.
2. Graduates implement complex data structures to insure efficient program execution.
3. Graduates utilize sound mathematical principles to solve complex programming problems.
4. Graduates implement algorithms in programming languages utilizing proper coding conventions and appropriate documentation standards.
5. Graduates apply effective technical communication skills.

Program Faculty

Mary Anderson
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Warren Sheaffer
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Cheng Thao
cheng.thao@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 & Info Systems	4
☐ CSCI 1523 Intro to Computing and Programming Concepts	4
☐ CSCI 1524 Intro to Algorithms & Data Structures	4
☐ CSCI 1533 ANSI C Language Programming	2
☐ CSCI 1541 Java Programming 1	4
☐ CSCI 2460 Discrete Structures of Computer Science	4
☐ CSCI 2469 Advanced Programming Principles	4
☐ CSCI 2570 Machine Architecture & Organization	4
Subtotal	**30**

General Education/MnTC Requirements	Cr
Refer to the Minnesota Transfer Curriculum Course List for each Goal Area	
☐ Goal 1: Communication ENGL 1711 Composition 1 – 4 cr ENGL 1712 Composition 2 -- 2 cr COMM 17XX – 3 cr	9
☐ Goal 3: Natural Sciences PHYS 2700 General Physics 1 – 5 cr	5
☐ Goal 4: Mathematical/Logical Reasoning MATH 2749 Calculus 1 - 4 cr MATH 2750 Calculus 2 OR MATH 1740 Introduction to Statistics - 4 cr	8
☐ Goal 5: History, Social Science and Behavioral Sciences	3
☐ Goal 6: Humanities and Fine Arts	3
☐ Goals 1-10 of the Minnesota Transfer Curriculum Select a minimum of 2 additional credits. Students must select courses from at least six (6) Goal Areas of the Minnesota Transfer Curriculum.	2
General Education Requirements	**30**

Total Program Credits 60

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

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

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 & Info Systems	4
Goal 1: ENGL 1711 Composition 1	4
Goal 4: MATH 2749 Calculus 1	4
Goals 1-10 of the Minnesota Transfer Curriculum	2
Total Semester Credits	**14**

Second Semester

CSCI 1523 Intro to Computing and Programming Concepts	4
CSCI 1541 Java Programming 1	4
Goal 3: PHYS 2700 General Physics 1	5
Goal 4: MATH 2750 Calculus 2 OR MATH 1740 Intro to Statistics	4
Total Semester Credits	**17**

Third Semester

CSCI 1524 Intro to Algorithms and Data Structures	4
CSCI 1533 ANSI C Language Programming (fall only)	2
CSCI 2570 Machine Architecture & Organization	4
Goal 1: ENGL 1712 Composition 2	2
Goal 5: History, Social Sciences, Behavioral	3
Total Semester Credits	**15**

Fourth Semester

CSCI 2460 Discrete Structures of Computer Science (spring only)	4
CSCI 2469 Advanced Programming Principles (spring only)	4
Goal 1: COMM 17XX	3
Goal 6: Humanities and Fine Arts	3
Total Semester Credits	**14**

Total Program Credits 60

See back of this guide for Transfer Opportunities

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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

Adv. Algebra & Functions: Score of 276+

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.

TPCS

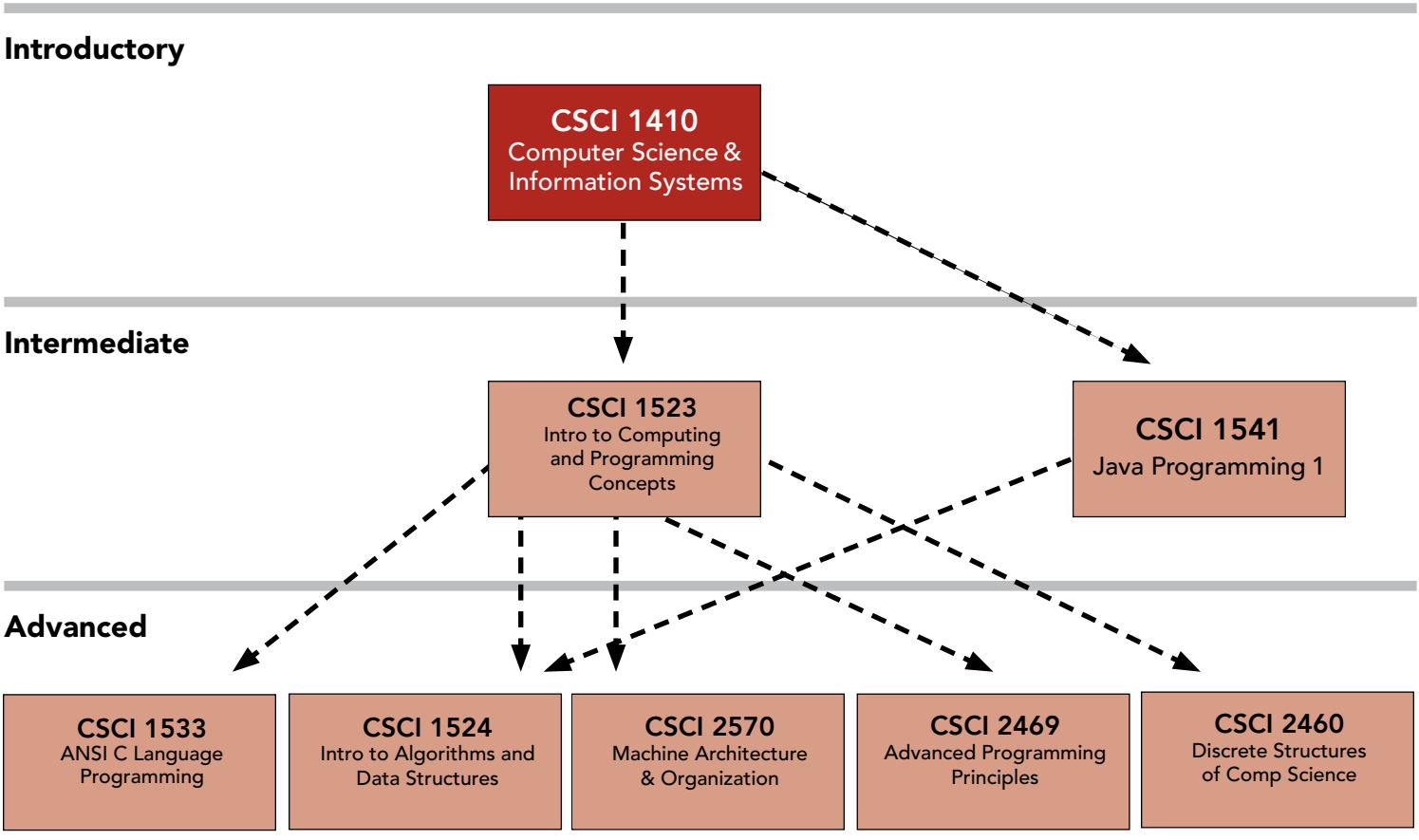
Computer Science Transfer Pathway AS DEGREE *(continued)*

(30 credits + 30 GenEd credits)

Transfer Opportunities

Saint Paul College has transfer agreements & partnerships between many post-secondary institutions. For more information please go to saintpaul.edu/Transfer.

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 mathematic 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. Analyze complex business processes to develop process improvements and comprehensive information system requirements specifications to support them.
2. Build and test information systems.
3. Utilize accounting and business systems information to develop recommendations for operating cost reduction and improved use of capital investment.
4. Demonstrate understanding of business systems, current technologies, organizational structures, communication tools, and critical thinking skills to help guide Management Information Systems success.
5. Apply effective technical communication skills.
6. Develop database applications using an industry standard database management system.
7. Demonstrate an understanding of computing and programming concepts.

Program Faculty

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Warren Sheaffer
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Cheng Thao
cheng.thao@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 ENGL 1711 Composition 1 – 4 cr COMM 17XX – 3 cr	7
☐ Goal 4: Mathematical/Logical Reasoning MATH 1740 Introduction to Statistics – 4 cr MATH 1730 College Algebra – 3 cr OR MATH 2749 Calculus 1 – 4 cr	7-8
☐ Goal 5: History, Social Science and Behavioral Sciences ECON 1720 Macroeconomics – 3 cr ECON 1730 Microeconomics – 3 cr	6
☐ Goals 1-10 of the Minnesota Transfer Curriculum. Select a minimum of 10-11 additional credits Students must select courses from at least six (6) Goal Areas of the Minnesota Transfer Curriculum.	10-11
General Education Requirements	**31**

Total Program Credits 60

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

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 1. 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 (spring only) 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

Management Information Systems AS DEGREE *(continued)*

(29 credits + 31 GenEd credits)

Transfer Opportunities

Saint Paul College has transfer agreements & partnerships between many post-secondary institutions. For more information please go to saintpaul.edu/Transfer.

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 or READ 0724 or EAPP 0900

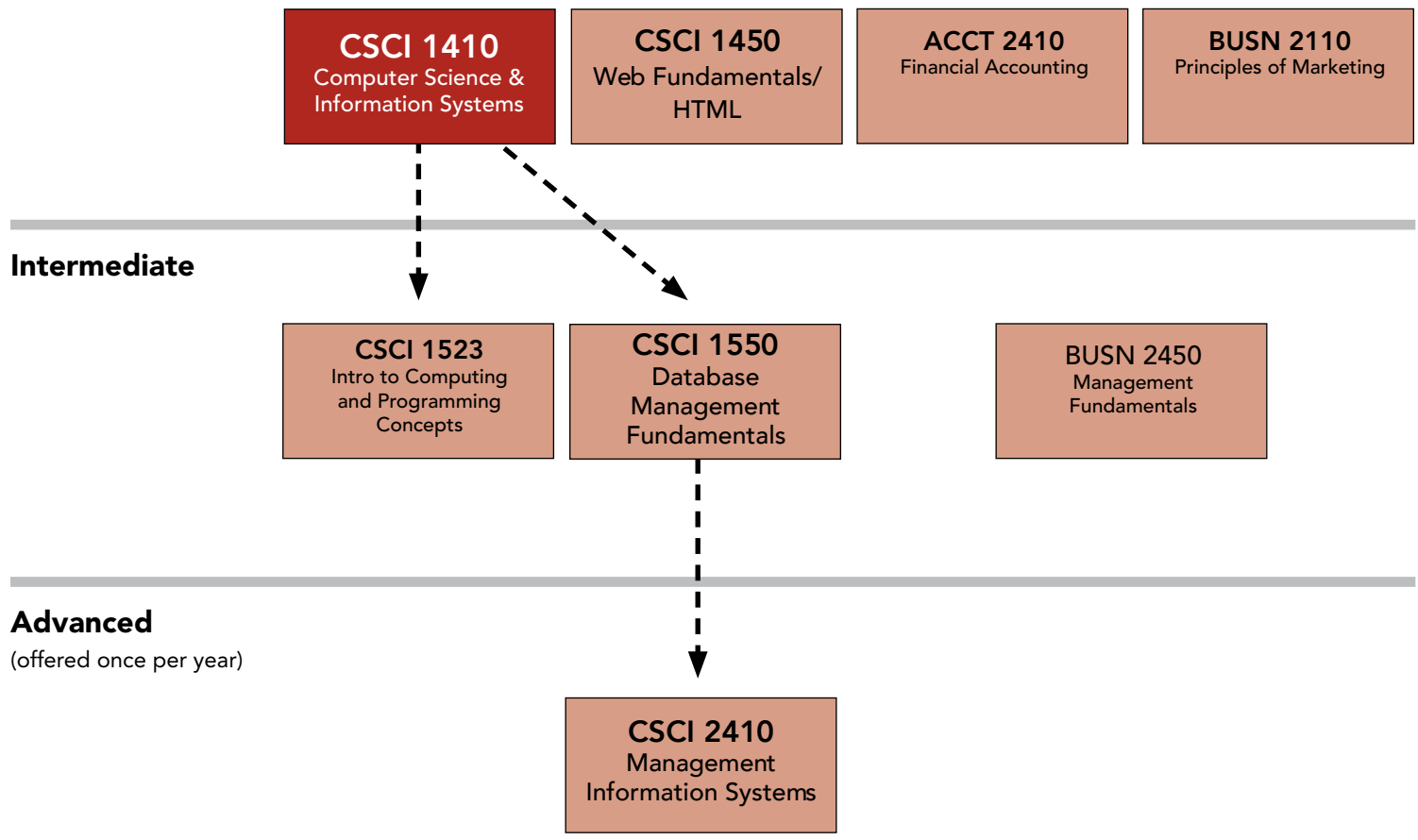
Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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.

232S

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



Computer Network Engineering AAS DEGREE

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. Design, construct and maintain computer networks.
2. Install, configure and maintain workstation and server based operating systems.
3. Explain the OSI model.
4. Develop programs and scripts needed to support network administration.
5. Troubleshoot hardware and software problems in a network environment.

Program Faculty

Mark Rawlings
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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 OR CSCI 1475 A+ Hardware/Operating System Prep.	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 2480 Network Security & Penetration Prevention.	4
☐ CSCI 2485 Computer Networking 5 – Cisco Enterprise Networking.	4
Subtotal	**44**

General Education Requirements	Cr
Refer to the Minnesota Transfer Curriculum Course List for each Goal Area	
☐ Goal 1: Communication ENGL 1711 Composition 1 – 4 cr COMM 17XX – 3 cr	7
☐ Goal 3 or Goal 4 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

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

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 OR CSCI 1475 A+ Hardware/Operating System Prep . . 4
CSCI 1440 Networking Fundamentals 4
Goal 1: ENGL 1711 Composition 1. 4
Total Semester Credits. 16

Second Semester

CSCI 2420 Computer Security 4
CSCI 2461 Computer Networking 3 – Linux. 4
CSCI 2465 Computer Networking 4 – Infrastructure 4
Goal 1: COMM 17XX 3
Total Semester Credits. 15

Third Semester

CSCI 1523 Intro to Computing and Programming Concepts 4
CSCI 2453 Computer Virtualization 4
Goal 3: Natural Science OR Goal 4: Mathematical/Logical Reasoning. 3
Goal 5: History, Social and Behavioral Sciences 3
Total Semester Credits. 14

Fourth Semester

CSCI 2451 Computer Networking 2 – Server. 4
CSCI 2480 Network Security & Penetration Prevention (spring only). 4
CSCI 2485 Computer Networking 5 – Cisco Enterprise Networking (spring only) 4
Goal 6: Humanities and Fine Arts 3
Total Semester Credits. 15

Total Program Credits 60

See back of this guide for Transfer Opportunities

Computer Network Engineering AAS DEGREE *(continued)*

(44 credits + 16 GenEd credits)

Transfer Opportunities

Saint Paul College has transfer agreements & partnerships between many post-secondary institutions. For more information please go to saintpaul.edu/Transfer.

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 or READ 0724 or EAPP 0900

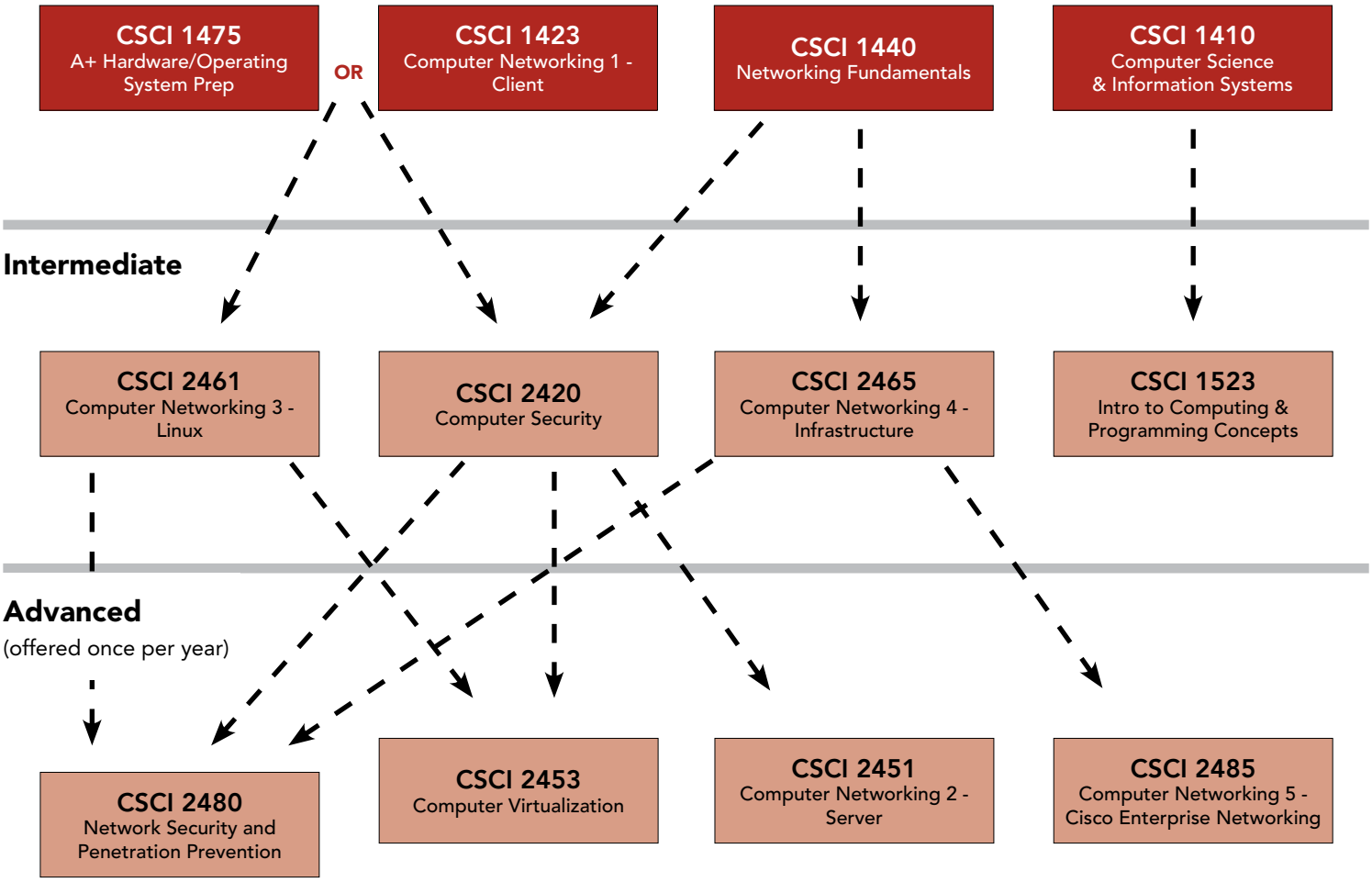
Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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.

037A

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



Computer Programming AAS DEGREE

Program Overview

The job of the applications programmer is to (1) review job specifications provided by the system analyst and end user and (2) plan, code, test, and document a programming solution which takes the available data input and produces the desired output in the form of a printed report or a screen display. The programming language(s) used depends on the nature of the problem and the languages available during installation.

Above average communications and math skills are required. Students should exhibit qualities of patience, perseverance and preciseness and should enjoy working in a team environment and also be able to work independently.

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. Jobs include: Programmer, Database Project Specialist, Applications Programmer, Technical Programmer, Systems Analyst, MIS Coordinator, Software Developer, Junior Programmer-Analyst, and Senior Programmer-Analyst.

Program Outcomes

Graduates will be able to

1. Graduates design and code computer programs in a variety of computer-programming languages.
2. Graduates professionally structure and document source codes.
3. Graduates utilize sound program testing procedures to insure the accuracy of the programs they develop.
4. Graduates use current program coding conventions to develop well documented code.
5. Graduates apply effective technical communication skills.
6. Graduates develop database applications using an industry standard database management system.
7. Graduates develop a computer program to create, modify and manipulate a relational database.
8. Graduates identify the similarities and differences between the Linux and Windows operating systems.

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

Program Faculty

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Cheng Thao
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Program Requirements

☑ Check off when completed

Course	Cr
☐ CSCI 1410 Computer Science & Information Systems	4
☐ CSCI 1423 Computer Networking – Client	4
☐ CSCI 1450 Web Fundamentals/HTML	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 2570 Machine Architecture and Organization	4
Subtotal	**28**

Complete one of the Emphases listed below 16

Java Program Emphasis	Cr
☐ CSCI 1542 Java Programming 2	4
☐ CSCI 1550 Database Management Fundamentals	4
☐ CSCI 2440 Client Side Programming I	4
☐ CSCI 2466 J2EE-JSP and Servlets	4
Total Emphasis Credits	**16**

Web Development Emphasis	Cr
☐ 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 Emphasis Credits	**16**

Web Based 2D Game Development Emphasis	Cr
☐ 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 Electives	4
☐ DGIM 1490 3D Animation Fundamentals	4
☐ DGIM 2560 Illustrator	4
☐ DGIM 1483 Photoshop 1	2
☐ DGIM 1484 Photoshop 2	2
Total Emphasis Credits	**16**

General Education Requirements	Cr
Refer to the Minnesota Transfer Curriculum Course List for each Goal Area	
☐ Goal 1: Communication ENGL 1711 Composition 1 – 4 cr COMM 17XX – 3 cr	7
☐ Goal 3 or Goal 4 Goal 3: Natural Sciences OR Goal 4: Mathematical/Logical Reasoning (MATH 1730 or proficiency required)	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

The following courses are not offered every semester.

Fall Semester Only

CSCI 1542 Java Programming 2
CSCI 2442 Server Side Programming
CSCI 2622 Client Side Programming 2
DGIM 1490 3D Animation Fundamentals
DGIM 2530 Web Based Game Design 1
DGIM 2560 Illustrator
DGIM 2586 Digital Sound

Spring Semester Only

CSCI 2440 Client Side Programming 1
CSCI 2466 J2EE-JSP and Servlets
DGIM 2521 2D Web Animation
DGIM 2531 Web Based Game Design 2

All other courses are offered both fall and spring semester pending course enrollment.

CSCI 1410, CSCI 1550, and General Education requirements are offered in the fall, spring, and summer.

See back of this guide for Course Sequence, Transfer Opportunities & 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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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.

009A

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 1. 4
Emphasis Course. 4
CSCI 1541 Java Programming I 4
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

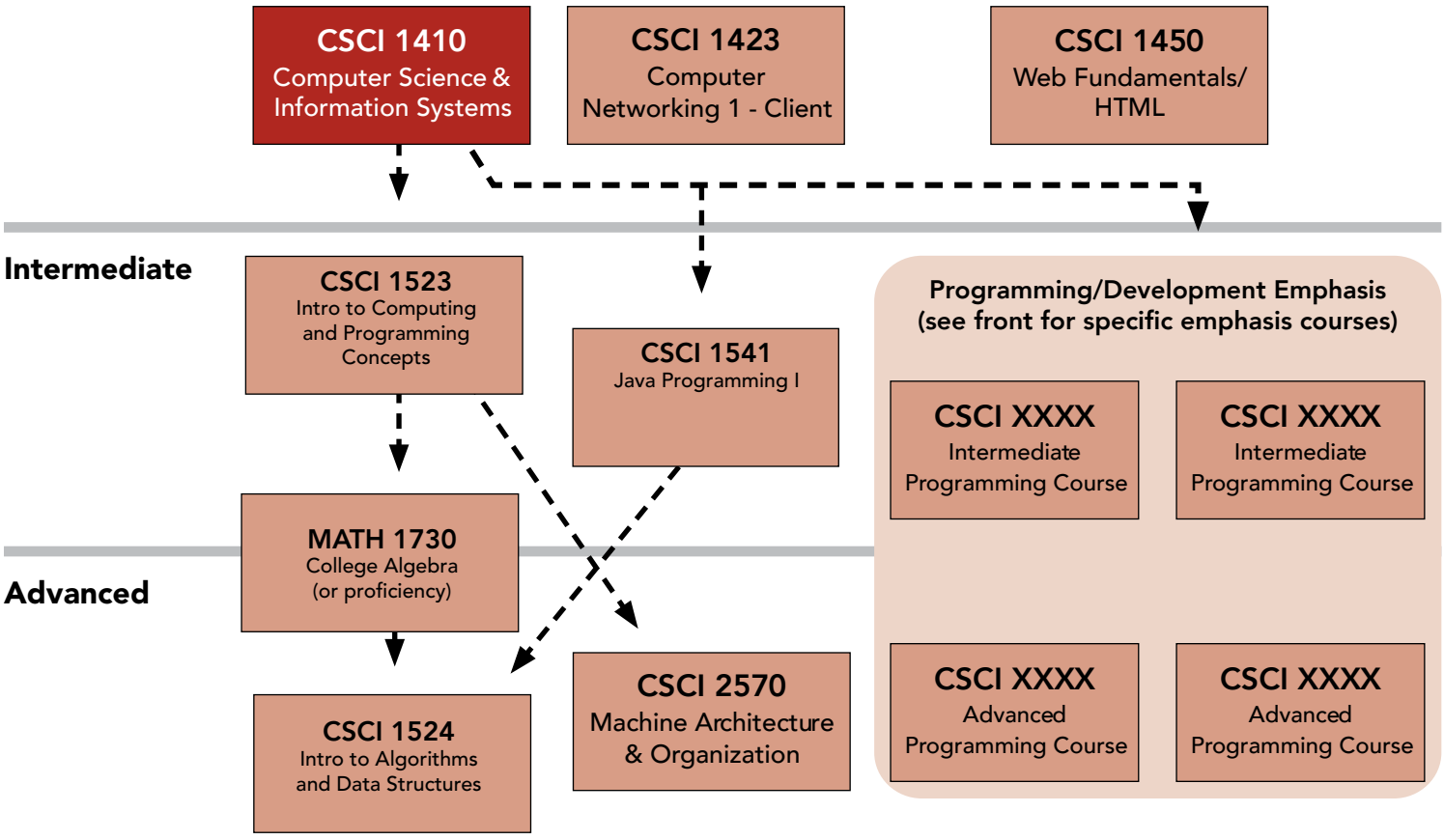
Fourth Semester

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 transfer agreements & partnerships between many post-secondary institutions. For more information please go to saintpaul.edu/Transfer.

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



Network Administration CERTIFICATE

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, administrating, 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. Design, construct, and maintain computer networks.
2. Install, configure, and maintain workstation based operating systems.
3. Explain the OSI model.
4. Troubleshoot hardware and software problems in a network environment.
5. Install and configure basic host and network security.

Program Faculty

Mark Rawlings
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Warren Sheaffer
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Program Requirements

☑ Check off when completed

Course	Cr
☐ CSCI 1410 Computer Science & Information Systems	4
☐ CSCI 1423 Computer Networking 1 – Client OR CSCI 1475 A+ Hardware/Operating System Preparation	4
☐ CSCI 1440 Networking Fundamentals	4
☐ CSCI 2420 Computer Security	4
☐ CSCI 2461 Computer Networking 3 – Linux	4
☐ CSCI 2465 Computer Networking 4 – Infrastructure	4
Total Program Requirements	**24**

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

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 1440 Networking Fundamentals	4
CSCI 1423 Computer Networking 1 – Client OR CSCI 1475 A+ Hardware/Operating System Preparation	4
Total Semester Credits	**12**

Second Semester

CSCI 2420 Computer Security	4
CSCI 2461 Computer Networking 3 – Linux	4
CSCI 2465 Computer Networking 4 – Infrastructure	4
Total Semester Credits	**12**

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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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

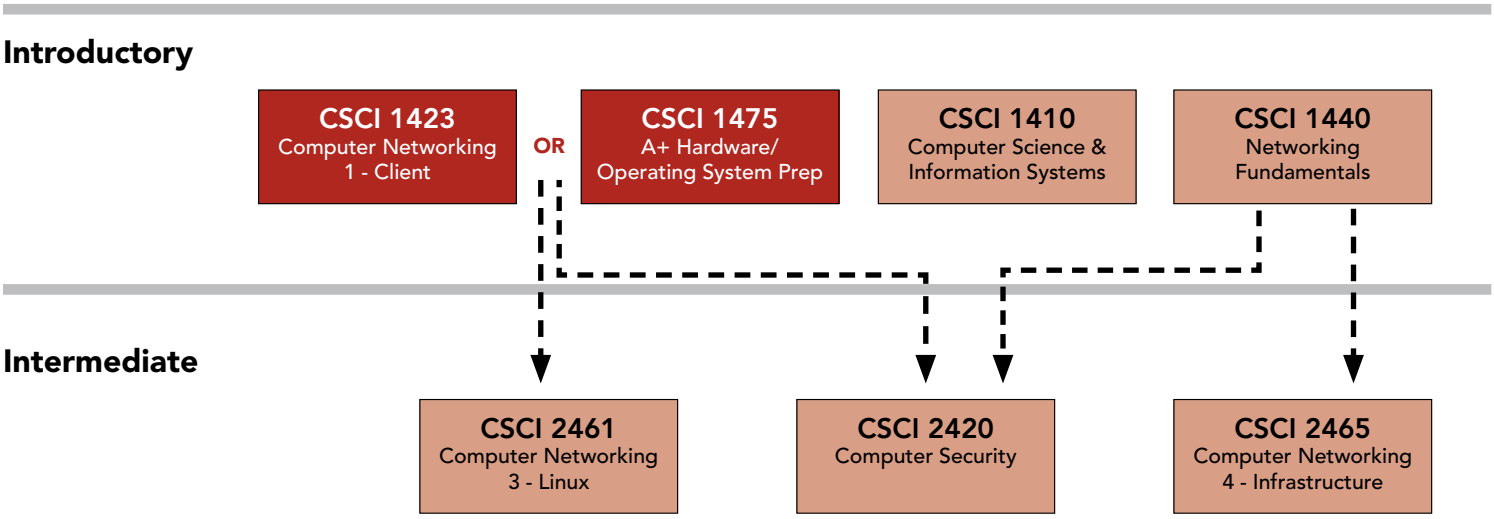
Assessment Results and Prerequisites: Students admitted into Saint Paul College programs may need to complete additional courses based on assessment results and course prerequisite requirements. Certain MATH, READ, and ENGL courses have additional prerequisites.

298C

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. Design and code computer programs in the Java programming language.
2. Develop database applications using an industry standard database management system.
3. Develop a Java program to create, modify and manipulate a relational database.
4. Apply effective technical communication skills.
5. Develop static web pages.

Program Faculty

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Warren Sheaffer
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Cheng Thao
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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**

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

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 (fall only) 4
Total Semester Credits 4

Fourth Semester

CSCI 2466 J2EE-JSP and Servlets (spring only) 4
Total Semester Credits 4

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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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

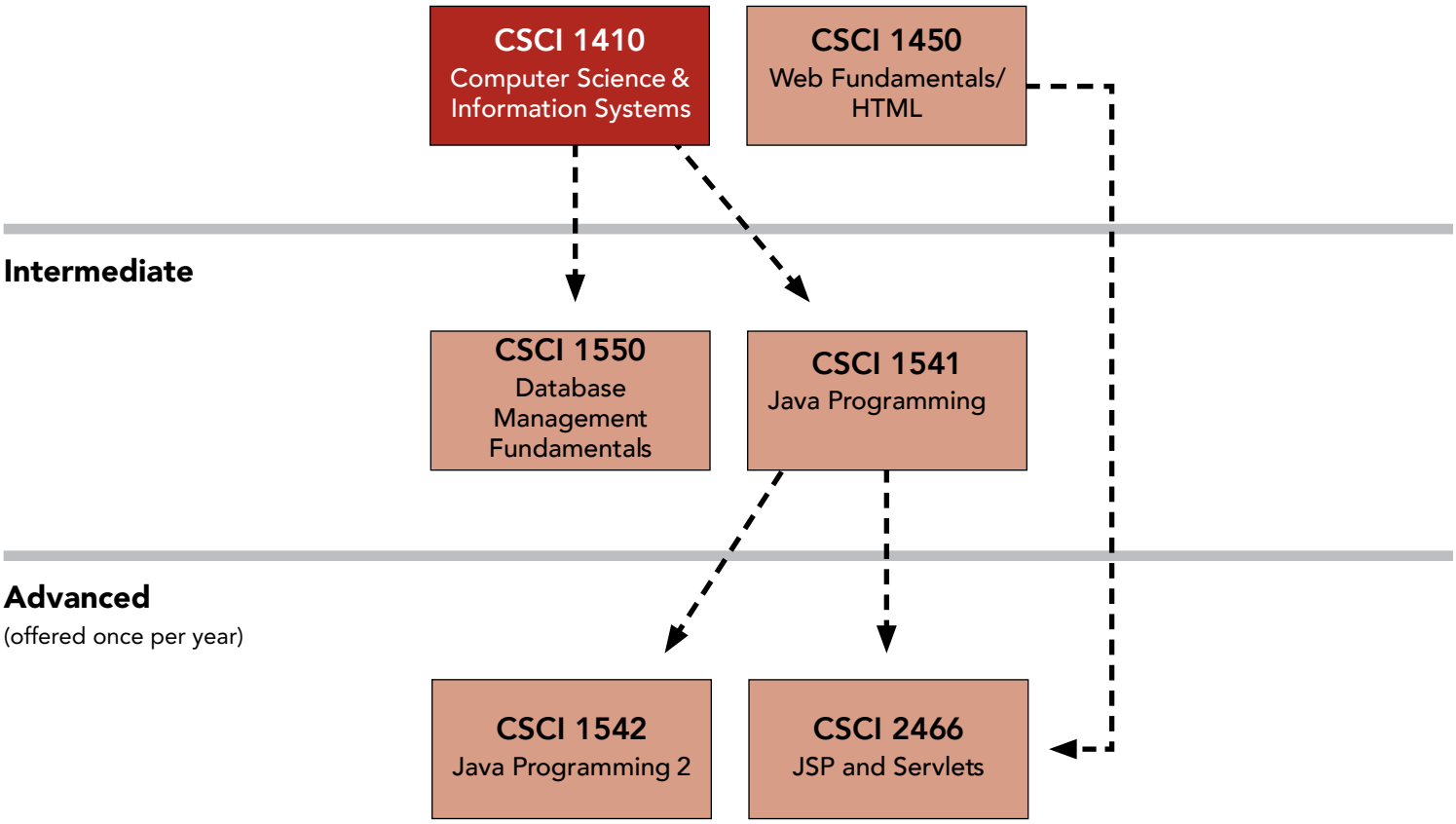
Assessment Results and Prerequisites: Students admitted into Saint Paul College programs may need to complete additional courses based on assessment results and course prerequisite requirements. Certain MATH, READ, and ENGL courses have additional prerequisites.

299C

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
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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 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**

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

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 (spring only) 4
DGIM Technical Electives 2
Total Semester Credits. 6

Third Semester

DGIM 2530 Web Based Game Design 1 (fall only) 4
DGIM 2586 Digital Sound (fall only) 2
Total Semester Credits. 6

Fourth Semester

DGIM 2531 Web Based Game Design 2 (spring only) 4
DGIM Technical Electives 2
Total Semester Credits. 6

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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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

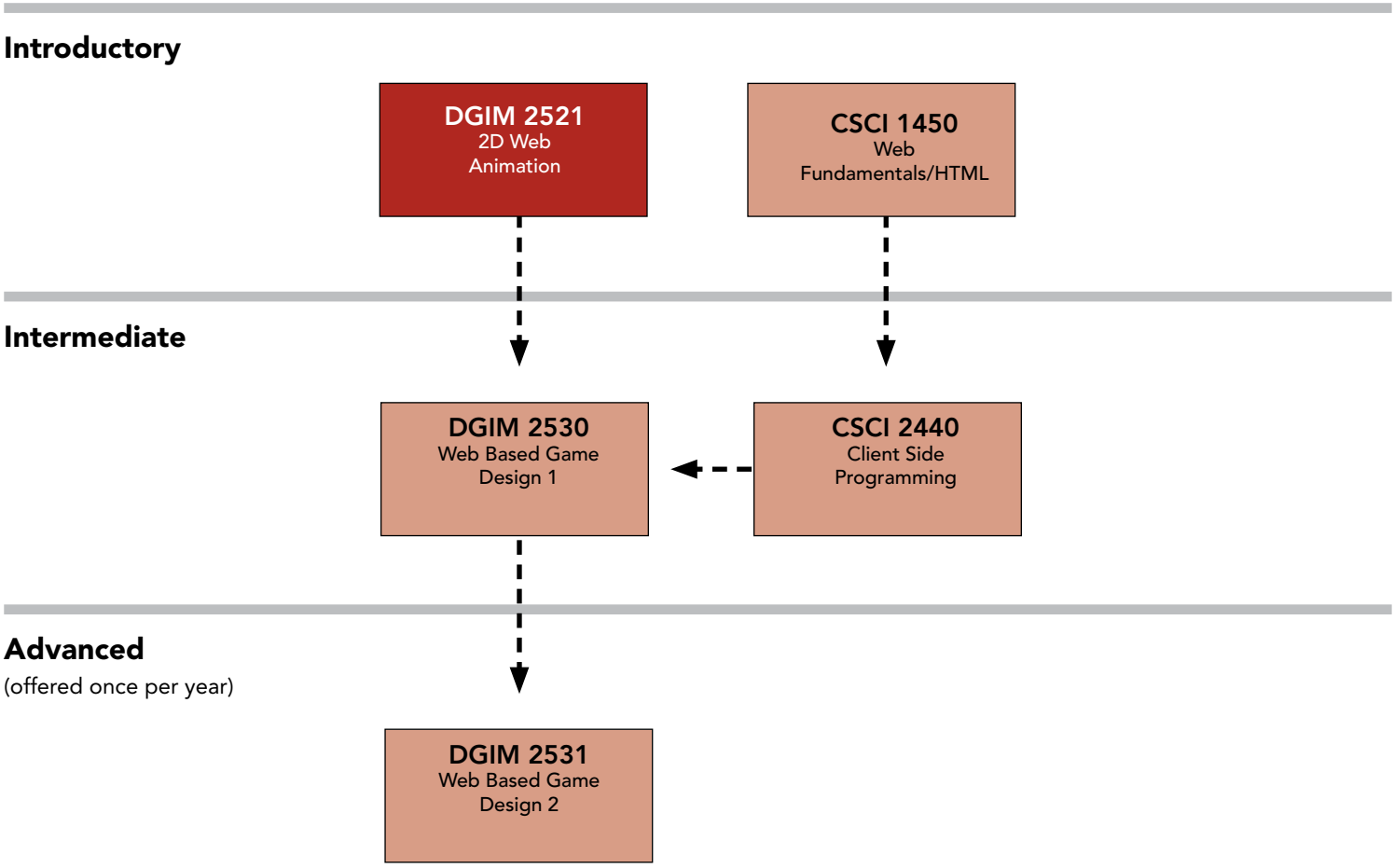
Assessment Results and Prerequisites: Students admitted into Saint Paul College programs may need to complete additional courses based on assessment results and course prerequisite requirements. Certain MATH, READ, and ENGL courses have additional prerequisites.

379C

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

(24 credits)

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



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
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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**

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

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 (spring only)	4
CSCI 2466 J2EE-JSP and Servlets (spring only)	4
Total Semester Credits.	**8**

Third Semester

CSCI 2442 Server Side Programming (fall only)	4
CSCI 2622 Client Side Programming 2 (fall only)	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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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

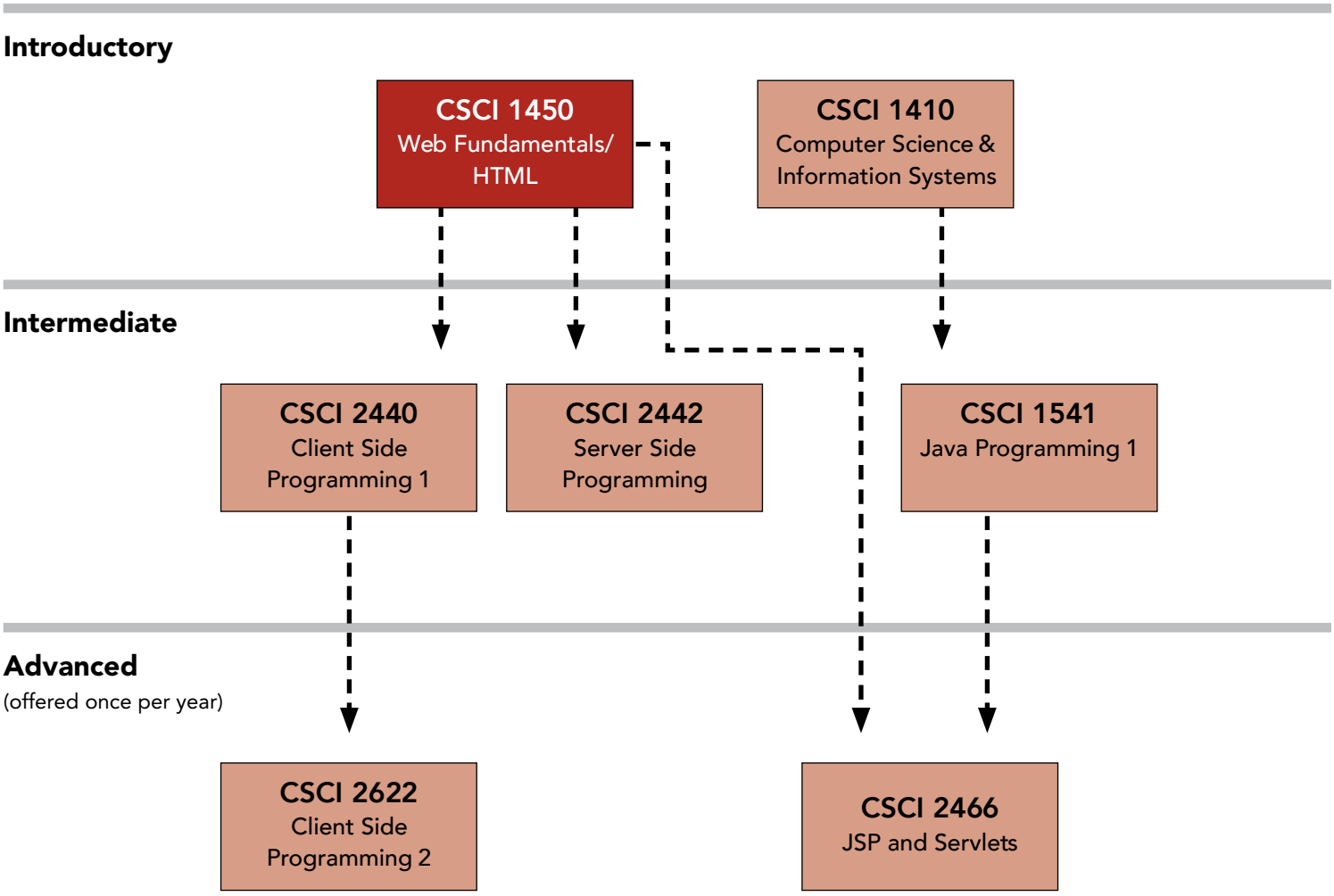
Assessment Results and Prerequisites: Students admitted into Saint Paul College programs may need to complete additional courses based on assessment results and course prerequisite requirements. Certain MATH, READ, and ENGL courses have additional prerequisites.

244C

Web Development CERTIFICATE *(continued)*

(24 credits)

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



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. Gather, cleanse and store large data sets for future analysis.
2. Manage large scale databases in specialized data management systems.
3. Analyze large data sets using specialized software.
4. Utilize sound mathematical and statistical principles to give meaning to data found in large data sets.
5. Apply effective technical communication skills.
6. Develop database applications using an industry standard database management system.
7. Design and code computer programs in a variety of computer-programming languages.

Transfer Opportunities

Saint Paul College has transfer agreements & partnerships between many post-secondary institutions. For more information please go to saintpaul.edu/Transfer.

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

Program Faculty

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Warren Sheaffer
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Cheng Thao
cheng.thao@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 1: 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 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+ or grade of "C" or better in READ 0722 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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.

389S

Geographic Information Science AAS DEGREE

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, georeferenceing, 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 Faculty

Kirk Stueve
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Program Requirements

☑ Check off when completed

Course	Cr
☐ 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	Cr
Refer to the Minnesota Transfer Curriculum Course List for each Goal Area	
☐ Goal 1: Communication ENGL 1711 Composition 1 – 4 cr COMM 17XX – 3 cr	7
☐ Goal 3: Natural Sciences BIOL 1725 Environmental Science	4
☐ Goal 4: Mathematical/Logical Reasoning MATH 1740 Introduction to Statistics	4
☐ Goal 5: History, Social Science and Behavioral Sciences GEOG 1700 Physical Geography	3
☐ 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 transfer agreements & partnerships between many post-secondary institutions. For more information please go to saintpaul.edu/Transfer.

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

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 1711 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 or READ 0724 or EAPP 0900

Writing: Score of 250+ on Reading Comprehension or grade of "C" or better in ENGL 0922 or EAPP 0900

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.

385A

Geographic Information Science CERTIFICATE

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
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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**

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

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.

385C