

Department of Mathematics, Engineering, and Computer Science

Majors for the Bachelor of Arts Degree

Civil Engineering (ABET accredited)
Computer Science
Mathematics with a Cognate Concentration
Mathematics: 3-2 Engineering
Mathematics for Secondary Education

Minors for the Bachelor of Arts Degree

Computer Science
Computer Science for Secondary Education
Mathematics

Philosophy and Goals of the Department

Consonant with the mission of the college, this department is “dedicated to providing for its students the means for their full realization of a dual goal of vocation and enlightenment.” Society requires competent professionals who can solve contemporary problems by using connections among disciplines, especially the humanities, engineering and technology, and the sciences. To this end, we offer programs that are designed to blend the unique characteristics of Catholic liberal arts education with preparation for productive and rewarding professional careers. Our goal is to assist students:

- 1) In acquiring the specialized knowledge and skills necessary for initiation into their chosen professions,
- 2) In developing a full range of effective communication skills,
- 3) In learning an appreciation for the interrelationships among the branches of knowledge, and
- 4) In gaining perspectives about the ethical, social, and aesthetic considerations that are necessary for values-based professional judgment and decision-making.

Major in Civil Engineering

The civil engineering program is accredited by the Engineering Accreditation Commission of the Accreditation Board of Engineering & Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012. Telephone: 410-347-7700.

I. Major Program Requirements

ENGR 104 Engineering Graphics and CAD Applications
ENGR 201 Engineering Design Process
ENGR 202 Water Distribution Systems
ENGR 302 Engineering Mechanics I: Statics
ENGR 303 Engineering Mechanics II: Solids
ENGR 305 Electrical Circuits and Electronics
ENGR 307 Fluid Mechanics
ENGR 308 Thermodynamics
ENGR 309 Geotechnical Engineering
ENGR 310 Structures I
ENGR 313 Hydrology
ENGR 401 Hydraulics
ENGR 402 Environmental Engineering Principles
ENGR 403 Structures I: Steel Design
ENGR 405 Water and Wastewater Treatment
ENGR 406 Structures II: Reinforced Concrete Design
ENGR 407 Transportation Engineering
ENGR 411-412 Senior Design Project

II. Other Program Requirements

EC 201 or 202 Principles of Economics (EC 202 preferred)
EC 203 Project Management Economics (pending approval)
CH 101-102 General Chemistry I and II
EN 325 Technical Writing
MA 131 Calculus, Difference and Differential Equations
MA 232 Calculus, Linear Algebra & Differential Equations
MA 233 Multivariable Calculus
MA 334 Differential Equations and Linear Algebra
MA 336 Probability and Statistics I
PHYS 205-206 Engineering Physics

Students must take the Fundamental of Engineering (FE) exam within nine months prior to receiving the degree.

To earn a Bachelor of Arts degree with a major in civil engineering, a student must earn a grade of “C” or better in all of the courses listed under “Major Program Requirements” and under “Other Program Requirements.” A lesser grade in any of these courses must be replaced before the Bachelor of Arts degree with a major in civil engineering will be granted. In addition, a lesser grade in one of these courses may preclude taking subsequent courses for which the deficient course is a prerequisite.

Major in Computer Science

I. Major Program Requirements

CS 110 Introduction to Computer Science: C++ Programming
CS 120 Data Structures and Program Design
CS 230 Software Engineering
CS 240 Software Engineering Project
CS 309 Computer Architectures
CS 310 Database and Information Retrieval
CS 330 Data Communications
CS 331 Computer Networking
CS 410 Operating Systems
CS 430 Senior Project
CS 495 Computer Science Seminar

II. Other Program Requirements

CO 206 Small Group Communications
EN 325 Technical Writing
MA 131 Calculus, Difference and Differential Equations
MA 232 Calculus, Linear Algebra & Differential Equations
MA 328 Modern Applications of Discrete Mathematics
Students are also **required to select a minor** approved by the computer science faculty.

To earn a Bachelor of Arts degree with a major or minor in computer science, a student must earn a grade of “C” or better in all of the courses listed under “Major Program Requirements” and under “Other Program Requirements.” A lesser grade in any of these courses must be replaced before the Bachelor of Arts degree with a major in computer science will be granted. In addition, a lesser grade in one of these courses may preclude taking subsequent courses for which the deficient course is a prerequisite.

Major in Mathematics with a Cognate Concentration, Minor, or Second Major

I. Major Program Requirements

MA 131	Calculus, Difference and Differential Equations
MA 232	Calculus, Linear Algebra & Differential Equations
MA 233	Multivariable Calculus
MA 301	Foundations of Mathematics
MA 328	Modern Applications of Discrete Mathematics
MA 334	Differential Equations and Linear Algebra
MA 336	Probability and Statistics I
MA 341	Probability and Statistics II
MA 342	Numerical Computing and Visualization
MA 401	Abstract Algebra and Applied Geometry
MA 421	Optimization
MA 4xx	Honors Thesis/Senior Project/Seminar (for a total of at least 4 credits)

II. Required Cognate Concentration, Minor, or Second Major

The course of study for a Bachelor of Arts degree with a major in mathematics requires selection of a cognate concentration, a minor, or a second major, approved by the student's faculty advisor and the chair of the mathematics department. Approved selections include Biology, Business and Economics, Chemistry, Computer Science, Engineering, and Environmental Science. In consultation with faculty advisors and the mathematics department chair, a student can develop a proposal for a cognate concentration, minor, or a second major other than those listed. Requirements for approved concentrations, minors, and second majors are as follows:

A. Concentration in Biology

A minor in biology plus at least twelve additional credits in science or engineering tailored to meet the student's particular interests and goals and approved by the mathematics department.

B. Concentration in Business and Economics

BA 203-204 Principles of Accounting I and II

BA 313 Managerial Finance

BA 375 Fundamentals of Management

BA 409 Operations Research

CS 213 Computer Applications in Business

EC 201-202 Principles of Economics I and II

Plus 6 additional BA or EC credits at the 200 level or above approved by the mathematics department.

C. Concentration in Chemistry

A minor in chemistry plus at least nine additional credits in science or engineering tailored to meet the student's particular interests and goals and approved by the mathematics department.

D. Concentration in Computer Science

A minor or a second major in computer science.

E. Concentration in Engineering

CH 101-102 General Chemistry

CS 110 Introduction to Computer Science: C++ Programming

ENGR 104 Engineering Graphics and CAD

ENGR 302 Engineering Mechanics I: Statics

PHYS 205-206 Engineering Physics I and II

Plus at least 12 additional semester-credit hours in engineering courses 300 or above.

F. Concentration in Environmental Science

BI 161-162 Introductory Biology

BI 211 Ecology

CH 101-102 General Chemistry

ENGR 402 Environmental Engineering Principles

ENGR 405 Water & Wastewater Treatment

EAS 201 Earth Science

EAS 302 Advanced Earth Science

III. Other Program Requirements

EN 325 Technical Writing

or EN 330 Business Writing (for the Business and Economics Concentration only)

To earn a Bachelor of Arts degree with a major in mathematics, a student must earn a grade of "C" or better in all of the courses listed under "Major Program Requirements," "Required Cognate Concentration or Minor," and "Other Program Requirements." A lesser grade in any of these courses must be replaced before the Bachelor of Arts degree with a major in mathematics will be granted. In addition, a lesser grade in one of these courses may preclude taking subsequent courses for which the deficient course is a prerequisite.

Major in Mathematics for Secondary Education

I. Broadfield Major Program Requirements

MA 131 Calculus, Difference and Differential Equations

MA 232 Calculus, Linear Algebra & Differential Equations

MA 233 Multivariable Calculus

MA 301 Foundations of Mathematics

MA 328 Modern Applications of Discrete Mathematics

MA 334 Differential Equations and Linear Algebra

MA 336 Probability and Statistics I

MA 341 Probability and Statistics II

MA 342 Numerical Computing and Visualization

MA 401 Abstract Algebra and Applied Geometry

MA 421 Optimization

MA 471 History Seminar in Mathematics

MA 4xx Honors Thesis/Senior Project/Seminar (for a total of at least 3 credits)

II. Other Program Requirements

Two semesters of college science approved by the mathematics department.

EN xxx One English writing course above EN 102

III. Professional Education Requirements

AN/SO 218 Introduction to Native American Studies

ED 102 Foundations of Education

ED/PSY 229 Educational Psychology

ED 245 Diversity Field Experience

ED 309 Teaching in the Secondary School

ED 327 Content Area Reading/Language Arts

ED 405 Education Seminar

ED 410 Student Teaching

ED 412 Measurement & Assessment in Teaching

ED 418 Teaching Mathematics in the Secondary School

HPE 214 The School Health Program
 PSY 228 Adolescent Psychology
 SPED 300 Introduction to Exceptional Children
 United States and contemporary world cultures course(s)
 see index for page number.

IV. Acceptance into the Teacher Education Program and the Student Teaching Program

A. Teacher Education Program: Students pursuing academic programs that lead to teacher licensure must be accepted into the teacher education program by the end of their sophomore year.

B. Student Teaching Program: All preservice teachers must obtain admission to the student teaching program in the spring semester of their junior year. For details see index for page numbers for Teacher Education and Student Teaching Programs.

Note: All secondary education students must consult both with the Department of Education: Health, Physical and Teacher and the Department of Mathematics, Engineering, and Computer Science.

3-2 Engineering: Major in Mathematics

A student who completes the requirements for the 3-2 Engineering Major in Mathematics earns two degrees:

1. A Bachelor of Arts degree with a major in mathematics from Carroll College, and
2. A Bachelor of Science degree with a major in a selected field of engineering (e.g., mechanical engineering) from one of the following affiliated engineering schools:

Columbia University, New York, NY
 The University of Notre Dame, South Bend, IN
 The University of Southern California, Los Angeles, CA
 The University of Minnesota, Minneapolis, MN
 Gonzaga University, Spokane, WA
 Montana Tech of the University of Montana, Butte, MT
 Montana State University, Bozeman, MT

Engineering fields, which 3-2 students may select, include the following:

Aerospace Engineering
 Engineering Mechanics
 Chemical Engineering
 Engineering Science
 Civil Engineering
 Geological Engineering
 Computer Engineering
 Geophysical Engineering
 Electrical Engineering
 Industrial Engineering
 Environmental Engineering
 Material Science Engineering
 Mechanical Engineering
 Metallurgical Engineering
 Applied Biology
 Mineral or Mining Engineering
 Applied Chemistry
 Nuclear Science and Engineering
 Applied Geophysics
 Operations Research

Biological Engineering
 Petroleum Engineering

The purposes of the 3-2 program are to provide the student with a traditional engineering education augmented with a strong liberal arts background and to provide a broader and deeper exposure to mathematics and its applications than would ordinarily be possible in a four year engineering program.

Under the 3-2 program, a student attends Carroll College for three years and then selects and transfers to one of seven affiliated engineering schools for two years of study. Upon successful completion of the five-year program, the student receives a Bachelor of Arts degree with a major in mathematics from Carroll College and a Bachelor of Science degree with a selected engineering major from the engineering school.

Carroll College continually reviews its curriculum with the seven affiliated schools to ensure that 3-2 students can complete any of the engineering majors in the five-year program. A program to prepare students for graduate studies in engineering is offered via the mathematics major with a cognate concentration in engineering.

A student in the 3-2 engineering program will be accepted at any one of the seven engineering schools on the written recommendation of the engineering program faculty. Before a student will be considered for a recommendation, at least a 2.60 cumulative grade average and a 2.60 average in the "Major Program Requirements" and in the "Other Program Requirements" must be achieved by the end of the fifth semester at Carroll College.

I. Major Program Requirements

ENGR 104 Engineering Graphics and CAD Applications
 ENGR 201 Engineering Design Process
 ENGR 302 Engineering Mechanics I: Statics
 ENGR 308 Thermodynamics

Technical Electives: Four courses of three or four credits each, selected on the basis of the engineering field of interest and with approval of the engineering advisor. Technical electives must be selected as follows: one from Category I, two from Category II, and one from Category III. Technical electives include the following courses:

CH 301-302 Organic Chemistry I and II (Category I and III)
 CS 330 Data Communication (Category III)
 ENGR 303 Engineering Mechanics II: Solids (Category II)
 ENGR 304 Engineering Mechanics III: Dynamics (Category III)
 ENGR 305-306 Electronics and Circuit Analysis I and II (Category I and III)
 ENGR 307 Fluid Mechanics (Category II)
 ENGR 309 Geotechnical Engineering (Category II)
 ENGR 310 Structures I (Category III)
 ENGR 313 Hydrology (Category III)

II. Other Program Requirements

EC 201 or 202 Principles of Economics (EC 202 preferred)
 EC 203 Project Management Economics (Pending approval)
 CH 101-102 General Inorganic Chemistry I and II
 CS 110 Introduction to Computer Science: C++ Programming
 EN 325 Technical Writing
 MA 131 Calculus, Difference and

	Differential Equations
MA 232	Calculus, Linear Algebra & Differential Equations
MA 233	Multivariable Calculus
MA 341	Probability and Statistics II
or MA 342	Numerical Computing and Visualization
MA 334	Differential Equations and Linear Algebra
MA 336	Probability and Statistics I
PHYS 205-206	Engineering Physics I and II

III. Carroll College Core Curriculum

To earn a Bachelor of Arts degree from Carroll College a student must complete the Carroll College Core Curriculum as listed in this catalog. However, since these requirements must be completed during the first three years at Carroll College, 3-2 engineering students must complete only six credits of social science instead of nine and a total of only nine credits of philosophy and theology instead of twelve, six credits of one and three credits of the other. In addition, a student must earn a grade of "C" or better in all of the courses listed under "Major Program Requirements" and "Other Program Requirements." A lesser grade in any of these courses must be replaced before the Bachelor of Arts degree will be granted. In addition, a lesser grade in one of these courses may preclude taking subsequent courses for which the deficient course is a prerequisite.

IV. Additional Requirements

1. The requirements for the Bachelor of Arts degree with a major in mathematics under the 3-2 program differ from those for the four-year mathematics majors. Students in the 3-2 engineering major are not required to fulfill the requirements for the four-year mathematics major.
2. The requirements listed in sections I, II, and III above must be completed before transferring to an affiliated engineering school and cannot be satisfied by credits earned at the engineering school after the student has transferred.
3. Students transferring to Carroll College and entering the 3-2 program must complete at least two full-time semesters at Carroll College before they will be considered for a recommendation to transfer to an affiliated school. In addition, these students must complete a minimum of eighteen credits in the Department of Mathematics, Engineering and Computer Science at Carroll College. Credits transferred to Carroll do not satisfy this requirement.
4. A Student who transfers to a non-affiliated engineering school and completes an engineering degree in an ABET accredited program is eligible to receive the Bachelor of Arts degree with a major in mathematics from Carroll College. The Carroll degree is awarded provided that the student has completed all requirements for the degree listed in sections I, II, and III.
5. Some engineering schools and/or departments require a grade point average higher than 2.60 for admission to junior and senior level courses. Some departments may also require the completion of a summer field or laboratory course for graduation in that department. In rare

cases, additional course work may be required to satisfy a specialized engineering curriculum. These are requirements that apply to all students entering these programs and must also be satisfied by 3-2 students. Students in 3-2 engineering must consult with the director of engineering programs at Carroll College to select a school and field of study for which they qualify.

Minor in Computer Science

I. Minor Program Requirements

CS 110	Introduction to Computer Science: C++ Programming
CS 120	Data Structures and Program Design
CS 230	Software Engineering
CS 310	Database and Information Retrieval
CS 495	Computer Science Seminar
Plus any two courses chosen from	
CS 240	Software Engineering Project
CS 309	Computer Architecture
CS 330	Data Communications
CS 331	Computer Networking
CS 410	Operating Systems

II. Other Program Requirements

Completion of MA 121-122 or MA 131-232 before taking 300-level courses in computer science.

Minor in Computer Science for Secondary Education

I. Minor Program Requirements

CS 110	Introduction to Computer Science: C++ Programming
CS 120	Data Structures and Program Design
CS 213	Computer Applications in Business
CS 309	Computer Architecture
CS 310	Database and Information Retrieval
CS 330	Data Communications
CS 495	Computer Science Seminar

II. Other Program Requirements

ED 418	Teaching Mathematics in the Secondary School
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Completion of MA 121-122 or MA 131-232 before taking 300-level courses in computer science.

MA 207	Elementary Statistics
MA 328	Modern Applications of Discrete Mathematics

III. Professional Education Requirements

See "Department of Education" and "Secondary Education Requirements" for the Professional Education Requirements.

Minor in Mathematics

Minor Program Requirements

Twenty-four semester-credit hours of mathematics courses, including:

MA 131	Calculus, Difference and Differential Equations
MA 232	Calculus, Linear Algebra, and Differential Equations

MA 233 Multivariable Calculus
MA 334 Differential Equations and Linear Algebra
MA 336 Probability and Statistics I

Remaining credits in mathematics must be selected from 300-level courses or above and must be approved by the mathematics program director.

Curriculum in Computer Science for the Associate of Arts Degree

Computer Science Course Requirements:
Completion of the requirements for the minor in computer Science