

SCHOOL OF MATHEMATICS AND NATURAL SCIENCE

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The School of Mathematics and Natural Science offers undergraduate courses and programs in biology, chemistry, physics, physical science, radiologic technology, mathematics, environmental science, and forensic science. Through effective teaching, advising, and scholarly activity, the School of Mathematics and Natural Science prepares students to engage in scientific inquiry and thought, select and pursue appropriate career options, become productive members of our scientific and technological society, and develop an appreciation of their own capabilities and accomplishments.

The School of Mathematics and Natural Science is comprised of three departments. The Biology Department offers courses in biology, radiologic technology in affiliation with a number of clinical sites, and environmental science, with degree programs in biology, biology education, radiologic technology, cytotechnology, and environmental science. The Chemistry and Physics Department offers courses in chemistry and physical science, with programs in chemistry, chemistry education, broad field science education, and natural science. Mathematics offers courses and programs in mathematics and mathematics education. In addition, forensic science is offered as an interdepartmental program across the School of Mathematics and Natural Science in partnership with the School of Criminal Justice. The School sponsors three outstanding student education and service organizations: the Science and Math Association (SMA), the Environmental Science Club, and the Pre-Health Professional Club.

Courses and programs emphasize a mastery of fundamental concepts and the scientific evidence or mathematical proofs on which they are based, in combination with critical thinking skills, effective communication, and research techniques. In its role of supporting the Liberal Arts Programs, Mathematics and Natural Science helps students understand the nature of scientific thought, the value and approaches of mathematics, and the roles of science and mathematics in society. Mathematics and Natural Science supports professional training of students in other schools, including business, education, and nursing, by providing training in specific mathematical

applications and basic sciences essential to those careers. Students majoring or minoring in the School of Mathematics and Natural Science are prepared for careers in teaching, research, government, and industry, and for advanced study in mathematics, natural science, and health professions.

PRE-HEALTH PROFESSIONS

Students desiring a pre-professional degree in one of the health sciences in preparation for applying to dental, medical, veterinary, physician assistant, pharmacy, optometry, occupational therapy, and physical therapy programs are advised to pursue a biology major/chemistry minor or a chemistry major/biology minor.

BIOLOGY DEPARTMENT (BS)

The Biology Department offers the following degree programs: majors in biology (BS), biology—cytotechnology (BS) and radiologic technology (BSRT), with minors in biology, biology education, and environmental science.

The biology program provides its students with broad training in many aspects of the biological sciences. Through lecture, laboratory, and field work, students gain valuable experience that prepares them for careers in allied health programs, industrial and biological research, environmental careers, and teaching. Students desiring certification for teaching biology in grades 5–12 take an additional major in middle–secondary education. The program also conducts several courses required for students entering nursing, thus serving the School of Nursing as well as biology majors.

Biology majors must achieve an average GPA of 2.50 their biology coursework before graduation. Transfer students must complete one-half of their major and one-third of their minor credits at Marian University.

General Education Program: 46-49 credits of University requirements. Major satisfies lab science common core and natural sciences elective core requirements.

Other requirements

16 credits:

- CHE 101 Principles of Chemistry I, 4 cr.
- CHE 102 Principles of Chemistry II, 4 cr.
- CHE 201 Organic Chemistry I — Lecture, 3 cr.
- CHE 202 Organic Chemistry II — Lecture, 3 cr.
- CHE 251 Organic Chemistry I — Laboratory, 1 cr.
- CHE 252 Organic Chemistry II — Laboratory, 1 cr.

BIOLOGY MAJOR

38 credits as follows:

28 credits:

- BIO 010 Biology Seminar I, 0 cr.
- BIO 020 Biology Seminar II, 0 cr.
- BIO 101 Biological Principles I & Lab, 4 cr.
- BIO 102 Biological Principles II & Lab, 4 cr.
- BIO 231 Botany & Lab, 4 cr.
- BIO 300 Biology Literature and Seminar, 2 cr.
- BIO 301 Genetics & Lab, 4 cr.
- BIO 302 Cell and Molecular Biology, 4 cr.
- BIO 311 Bacteriology & Lab, 4 cr.
- BIO 424 Senior Research in Biology, 2 cr.

4-8 credits from the following:

- BIO 201 Anatomy & Physiology I, 4 cr.
- BIO 202 Anatomy & Physiology II, 4 cr.
- BIO 310 Invertebrate Zoology & Lab, 4 cr.
- BIO 312 Developmental Biology & Lab, 4 cr.
- BIO 322 Vertebrate Zoology & Lab, 4 cr.

2-6 credits: Biology electives

Biology/middle-secondary education double majors must take the following courses, which may apply toward their biology electives:

- BIO 310 Invertebrate Zoology & Lab, 4 cr.
- BIO 322 Vertebrate Zoology & Lab, 4 cr.
- BIO 104 Environmental Science & Lab, 4 cr.

OR

- BIO 315 Ecology, 3 cr.

Other math and science courses outside of biology required for teaching certification in biology/middle-secondary education are:

- MAT 112 Pre-Calculus Mathematics, 5 cr.
 - MAT 122 Introduction to Probability and Statistics, 4 cr.
 - PHS 108 Earth Science & Lab, 4 cr.
 - PHS 211 Elementary Physics & Lab, 5 cr.
- OR**
- PHS 203 University Physics I & Lab, 5 cr.
 - PHS 205 University Physics II & Lab, 5 cr.

BIOLOGY MINOR

23 credits:

- BIO 101 Biological Principles I & Lab, 4 cr.
- BIO 102 Biological Principles II & Lab, 4 cr.
- BIO 231 Botany, 4 cr.
- BIO 301 Genetics, 4 cr.
- BIO 302 Cell and Molecular Biology, 4 cr.
- BIO Biology electives, 3 cr.

BIOLOGY EDUCATION MINOR

31 credits:

- BIO 100 Life Systems, 3 cr.
- BIO 150 Life Systems Lab, 1 cr.
- BIO 231 Botany, 4 cr.
- BIO 301 Genetics, 4 cr.
- BIO 302 Cell and Molecular Biology, 4 cr.
- BIO 310 Invertebrate Zoology, 4 cr.
- BIO 322 Vertebrate Zoology, 4 cr.
- BIO 104 Environmental Science, 4 cr.
- BIO 315 Ecology, 3 cr.

BIOLOGY-CYTOTECHNOLOGY PROGRAM (BS)

The biology-cytotechnology program is a BS degree in biology with a sub specialization in cytotechnology, the study of cells exfoliated or removed from the body for determination of the cancerous vs. normal state. Following completion of their science, mathematics, and liberal arts requirements at Marian, cytotechnology majors apply for admission to one year of professional training at the accredited School of Cytotechnology, State Laboratory of Hygiene, Madison, Wis.

Students must meet all of the requirements for the biology major (see biology program). The courses below must be taken as part of the sub specialization.

BIOLOGY-CYTOTECHNOLOGY MAJOR

Biology Major Requirements to include the cytotechnology sub specialization requirements:

11-12 credits as follows:

8 credits:

- BIO 201 Anatomy and Physiology I, 4 cr.
- BIO 202 Anatomy and Physiology II, 4 cr.

3-4 credits from the following:

- BIO 402 Virology & Lab, 4 cr.
- BIO 422 Immunology, 3 cr.

4 credits:

- MAT 122 Introduction to Probability and Statistics, 4 cr.

32 credits:

- School of Cytotechnology

ENVIRONMENTAL SCIENCE MINOR

The Environmental Science minor is an optional minor for elementary–middle education majors or a support minor for science majors.

24 credits as follows:

7 credits:

- BIO 104 Environmental Science & Lab, 4 cr.
BIO 315 Ecology, 3 cr.

1-2 credits from the following:

- BIO 304 Field Study, 1–2 cr.
BIO 424 Senior Research in Biology, 2 cr.

4–8 credits from the following:

- BIO 100 Life Systems, 3 cr.
BIO 150 Life Systems Laboratory, 1 cr.
OR
BIO 101 Biological Principles I & Lab, 4 cr.
BIO 102 Biological Principles II & Lab, 4 cr.

7–12 credits from the following:

- BIO 114 Environmental Stewardship, 4 cr.
BIO 221 Fall Flora, 1 cr.
BIO 222 Spring Flora, 1 cr.
BIO 231 Botany and Lab, 4 cr.
BIO 301 Genetics and Lab, 4 cr.
BIO 310 Invertebrate Zoology and Lab, 4 cr.
BIO 311 Bacteriology and Lab, 4 cr.
BIO 312 Developmental Biology and Lab, 4 cr.
BIO 322 Vertebrate Zoology and Lab, 4 cr.
BIO 342 Ornithology and Lab, 4 cr.
BIO 365 Ecology Laboratory, 1 cr.
PHS 108 Earth Science & Lab, 4 cr.
PHS 110 Introduction to Meteorology & Lab, 4 cr.

RADIOLOGIC TECHNOLOGY PROGRAM (BSRT)

(2 to 3 years academic + 2 years professional study)

Upon completion of the required Marian University courses and admission to and completion of an independent accredited clinical program, the traditional program in Radiologic Technology leads to a BSRT degree. Those who are already certified may take accelerated classes in the MAAP program to fulfill the requirements for the BSRT degree.

RADIOLOGIC TECHNOLOGY MAJOR

General Education Program: 46-49 credits of University requirements. Major satisfies natural

sciences lab science and elective core requirements, and the applied liberal arts elective core requirement.

Other requirements

87 credits as follows:

27 credits:

- BIO 100 Life Systems, 3 cr.
BIO 150 Life Systems Laboratory, 1 cr.
CHE 103 General, Organic and Biochemistry, 5 cr.
BIO 201 Anatomy and Physiology I, 4 cr.
BIO 202 Anatomy and Physiology II, 4 cr.
BIO 220 Introduction to Medical Terminology, 2 cr.
PHS 211 Elementary Physics, 5 cr.
TEC 102 Computer Software Applications, 3 cr.
General Elective, 2 cr. (ATC 101 and ATC 111 recommended)

60 credits:

Two years in a Radiologic Technology program from an accredited School of Radiologic Technology. It is the student's responsibility to seek acceptance at an accredited School of Radiologic Technology.

Students will register for four courses to maintain continuous enrollment at Marian University and to indicate their progress in their off-campus training, beginning with their entrance into an accredited School of Radiologic Technology as follows:

- RAD 380 Radiologic Technology Clinical I, 15 cr.
RAD 390 Radiologic Technology Clinical II, 15 cr.
RAD 400 Radiologic Technology Clinical III, 15 cr.
RAD 410 Radiologic Technology Clinical IV, 15 cr.

A BSRT completion program is offered through MAAP as well. See the Marian Adult Accelerated Program section of this bulletin for more information.

CHEMISTRY AND PHYSICS DEPARTMENT (BS)

The Chemistry and Physics Department offers majors in chemistry and broad field science education, and minors in chemistry, chemistry education, and natural science.

The Chemistry and Physics Department provides its students with courses and experiences in a wide variety of areas in the discipline of chemistry. It prepares students for entrance into the chemical industry, graduate school, health profession schools, and teaching science in elementary and secondary schools. Students desiring certification for teaching

science in grades 5–12 take an additional major in middle–secondary education. The program also serves students in the School of Nursing, and offers courses in physics and physical science to support a variety of disciplines. Chemistry majors must achieve an average GPA of 2.50 in their chemistry courses before graduation. Transfer students must complete 18 or more of their chemistry credits at Marian University for the chemistry major and must complete eight or more of their chemistry credits at Marian University for the chemistry minor.

General Education Program: 46-49 credits of University requirements

Major satisfies the lab sciences, mathematics, and the natural science elective in the Liberal Arts Core Curriculum.

CHEMISTRY MAJOR

34–36 credits:

- CHE 101 Principles of Chemistry I, 4 cr.
- CHE 102 Principles of Chemistry II, 4 cr.
- CHE 201 Organic Chemistry I, 3 cr.
- CHE 202 Organic Chemistry II, 3 cr.
- CHE 251 Organic Chemistry I Lab, 1 cr.
- CHE 252 Organic Chemistry II Lab, 1 cr.
- CHE 300 Analytical Chemistry, 4 cr.
- CHE 301 Instrumental Analysis, 4 cr.
- CHE 401 Physical Chemistry I, 3 cr.
- CHE 402 Physical Chemistry II, 3 cr.
- CHE 412 Chemistry Literature and Seminar, 1 cr.
- CHE 420 Senior Research, 1–3 cr.
- CHE 451 Physical Chemistry I Lab, 1 cr.
- CHE 452 Physical Chemistry II Lab, 1 cr.

2 credits:

- CHE Chemistry electives, 2 cr. (choose from course numbers above 200)

Chemistry/middle-secondary education double majors are strongly recommended to take CHE 302 Biochemistry as their chemistry elective. Other science courses required for chemistry/middle-secondary education are:

- BIO 101 Biological Principles I and Lab, 4 cr.
- BIO 102 Biological Principles II and Lab, 4 cr.
- BIO 104 Environmental Science and Lab, 4 cr.

Other requirements

20 credits as follows:

10 credits:

- MAT 201 Calculus I, 5 cr.
- MAT 202 Calculus II, 5 cr.

10 credits:

- PHS 203 University Physics I, 5 cr.
- PHS 205 University Physics II, 5 cr.

CHEMISTRY MINOR

24 credits as follows:

12 credits:

- CHE 101 Principles of Chemistry I, 4 cr.
- CHE 102 Principles of Chemistry II, 4 cr.
- CHE 300 Analytical Chemistry, 4 cr.

12 credits:

- CHE Chemistry electives, 12 cr. (choose from course numbers 200 level and above)

CHEMISTRY EDUCATION MINOR

24–25 credits as follows:

20 credits:

- CHE 101 Principles of Chemistry I, 4 cr.
- CHE 102 Principles of Chemistry II, 4 cr.
- CHE 201 Organic Chemistry I, 3 cr.
- CHE 202 Organic Chemistry II, 3 cr.
- CHE 251 Organic Chemistry I Lab, 1 cr.
- CHE 252 Organic Chemistry II Lab, 1 cr.
- CHE 300 Analytical Chemistry, 4 cr.

4–5 credits from the following:

- CHE 301 Instrumental Analysis, 4 cr.
- CHE 302 Biochemistry, 5 cr.

22 credits as follows:

12 credits:

- BIO 101 Biological Principles I, 4 cr.
- BIO 102 Biological Principles II, 4 cr.
- BIO 104 Environmental Science, 4 cr.

10 credits:

- PHS 203 University Physics I, 5 cr.
- PHS 205 University Physics II, 5 cr.

Additional requirements

All other courses normally applicable to the middle–secondary education major in sciences.

BROAD FIELD SCIENCE EDUCATION MAJOR

28 credits as follows:

14 credits in each of the following:

Biology including BIO 104 Environmental Science and Lab
Chemistry

16 credits as follows:

8 credits in each of the following:

Earth and Space Science
Physics

10 additional credits from:

Biology, chemistry and/or philosophy of science

6 credits: Mathematics

NATURAL SCIENCE MINOR

This minor is available to all students, but will be of greater interest to students majoring in Elementary–Middle Education. The minor is made up of a series of courses designed to satisfy the requirements of the Wisconsin Department of Public Instruction for a science minor, for certification in grades 1–6 and/or grades 1–9.

29 credits as follows:

13 credits:

PHS 108 Earth Science & Lab, 4 cr.
PHS 110 Introduction to Meteorology & Lab, 4 cr.
PHS 211 Elementary Physics, 5 cr.

4 credits from the following:

BIO 102 Biological Principles II & Lab, 4 cr.
BIO 100 Life Systems, 3 cr.
BIO 150 Life Systems Laboratory, 1 cr.

8 credits:

CHE 101 Principles of Chemistry I, 4 cr.
CHE 102 Principles of Chemistry II, 4 cr.

4 credits:

BIO 104 Environmental Science & Lab, 4 cr.

Mathematics and Natural Science Prerequisites:

MAT 112 Pre-Calculus Mathematics, 5 cr.
BIO 101 Biological Principles I and Lab, 4 cr. (if taking BIO 102)

Students seeking certification for grades 1–9 must also student-teach in their minor in the middle school.

FORENSIC SCIENCE PROGRAM (BS)

In collaboration with the School of Criminal Justice, the Forensic Science Program combines knowledge of criminal justice in its broadest sense with thorough training in the approaches, knowledge, and analytical techniques of the laboratory scientist. Forensic science technicians may be called on to analyze a wide variety of evidence and events, such as blood spatter and blood chemistry; physical forces produced by auto impacts and other human body traumas; microscopic matching of hairs, tools, and weapons with their sources and trace evidence at a crime scene; genetic and enzymatic comparisons of fluids and tissues; and time of death determinations based on biological and chemical processes. Consequently, forensic science technicians require thorough preparation in a broad array of science disciplines and mathematics, including physics, biology, chemistry, and statistics. This intense and broad program of study includes all courses required for application to most health professions programs, including medicine, dentistry, optometry, and veterinary schools. In addition, this program includes the array of chemistry, physics, math, and biology expected of candidates seeking employment in industrial quality control, many basic science laboratories, and industrial product development laboratories.

FORENSIC SCIENCE MAJOR

General Education Program: 46-49 credits of University requirements. Major satisfies natural sciences and mathematics common and elective core requirements, and the laboratory common core requirement.

Other requirements: The forensic science major requires completion of a concurrent minor in chemistry, including CHE 302: Biochemistry.

50-53 credits as follows:

47-49 credits:

BIO 101 Biological Principles I, 4 cr.
BIO 102 Biological Principles II, 4 cr.
BIO 301 Genetics & Lab, 4 cr.
CRJ 102 Constitutional Law, 3 cr.
CRJ 302 Criminal Procedures, 3 cr.
CRJ 340 Principles of Judicial Practice, 3 cr.
CRJ 350 Principles of Professional Practice, 3 cr.
FOS 105 Survey of Forensic Sciences, 1 cr.
FOS 304 Forensic Science I - Rules of Evidence, 3 cr.
FOS 305 Forensic Science II – Analytical Methods, 4 cr.
FOS 405 Forensic Science III – Advanced Methods, 4 cr.

- FOS 497 Internship, 1-3 cr.
- PHS 203 University Physics I, 5 cr.
- PHS 205 University Physics II, 5 cr.

3-4 credits:

- CRJ 214 Stat Techniques Research Data Analysis, 3 cr.
- MAT 122 Introduction to Probability and Statistics, 4 cr.
- MAT 304 Introduction to Mathematical Statistics I, 3 cr.

Chemistry minor required

24 credits:

- CHE 101 Principles of Chemistry I, 4 cr.
- CHE 102 Principles of Chemistry II, 4 cr.
- CHE 201 Organic Chemistry I, 3 cr.
- CHE 202 Organic Chemistry II, 3 cr.
- CHE 251 Organic Chemistry I Lab, 1 cr.
- CHE 300 Analytical Chemistry, 4 cr.
- CHE 302 Biochemistry, 5 cr.

3-6 credits:

University electives

MATHEMATICS DEPARTMENT (BS)

The Mathematics Department offers a BS degree with a major in mathematics and minors in mathematics and mathematics education.

The Mathematics Department presents the student with an aesthetic view of mathematics as well as the role of mathematics in science, technology, business and other fields. The variety of courses in introductory mathematics, calculus, geometry, algebra, probability, and statistics offers the student a wide range of choices to meet their interests. The program provides the student with the necessary mathematical knowledge and skills to pursue further study in mathematics and careers in education, business, science, and government. The Mathematics Department's recommendation for students taking their first course in mathematics is made on the basis of the student's ACT score, high school record, University objectives, and/or an Accuplacer assessment. Students desiring state certification to teach mathematics in grades 5–12 take an additional major in middle–secondary education. All mathematics majors must achieve an average GPA of 2.50 in their mathematics courses applicable to the degree (e.g., MAT 201 and above) before graduation. Transfer students must complete one-half of their major credits and one-third of their minor credits at Marian University.

General Education Program: 46-49 credits of University requirements. Major and minor satisfy the Mathematics core.

MATHEMATICS MAJOR

41 credits as follows:

26 credits:

- MAT 201 Calculus I, 5 cr.
- MAT 202 Calculus II, 5 cr.
- MAT 212 Introduction to Abstract Mathematics, 3 cr.
- MAT 301 Calculus III, 4 cr.
- MAT 304 Introduction to Mathematical Statistics I, 3 cr.
- MAT 334 Linear Algebra, 3 cr.
- MAT 344 Abstract Algebra, 3 cr.

3 credits from the following:

- MAT Math elective (must be numbered 204 or above)
- MTE 200 Mathematics Educ. and Technology, 3 cr.
- TEC 212 Computer Programming I, 3 cr.
- TEC 223 Visual Programming I, 3 cr.

Mathematics/Middle-Secondary Education double majors should use MTE 200 for this requirement.

12 credits:

- MAT Electives (must be numbered above 300)

Mathematics/middle-secondary education double majors must include MAT 314 Modern Geometry, 4 cr., in these electives. They must also take MTE 375 Historical Topics in Mathematics, 2 cr., and may petition their advisor for it to apply toward their 12 credits of math electives numbered above 300.

MATHEMATICS MINOR

25 credits as follows:

19 credits:

- MAT 201 Calculus I, 5 cr.
- MAT 202 Calculus II, 5 cr.
- MAT 212 Introduction to Abstract Mathematics, 3 cr.
- MAT 304 Introduction to Mathematic Statistics I, 3 cr.
- MAT 334 Linear Algebra, 3 cr.

3 credits from the following:

- MTE 200 Mathematics Educ. and Technology, 3 cr.
- TEC 212 Computer Programming I, 3 cr.
- TEC 223 Visual Programming I, 3 cr.

3 credits:

MAT Math elective, 3 cr.
(must be numbered above 300)

MATHEMATICS EDUCATION MINOR**25 credits:**

MAT 150 Mathematics for Elementary School
Teachers I, 3 cr.
MAT 151 Mathematics for Elementary School
Teachers II, 3 cr.
MTE 288 Mathematics for Middle School
Teachers I, 3 cr.
MTE 289 Mathematics for Middle School
Teachers II, 3 cr.
MTE 375 Historical Topics in Mathematics, 2 cr.
MAT 201 Calculus I, 5 cr.
MAT 212 Introduction to Abstract Mathematics,
3 cr.
MTE 200 Mathematics Education and Technology,
3 cr.