The Science Department of Cretin-Derham Hall provides science offerings for students of all ability levels. There is a three-year requirement for graduation. This requirement may be met by a variety of combinations that fit individual student abilities and needs

Students are encouraged to get a broad background across the various fields of science before specializing in one area. Students who apply to college must be aware that many colleges require three years of science.

The most common sequence recommended for college bound students is:

GRADE 9	GRADE 10	GRADE 11	GRADE 12
Science and Engineering *College Prep or* *Advanced or* *Honors*	Biology *College Prep or* *Advanced or* *Honors*	Chemistry *Living by Chemistry or* *Advanced or* *Honors*	Physics *Advanced or* *EPP (U of MN) or* *Honors*

When different levels of courses are offered, the department will assist students in finding the program which best fits their abilities and goals.

Requirement - Grade 9: Science and Engineering

This course is offered at the college prep level and also at advanced and honor levels. The levels differ in mathematical depth and the rate at which material will be covered. At each level, students will be encouraged to build skills, which will provide a foundation for understanding how science and technology affect everyday life and will become ready to continue their study of the sciences.

SCIENCE and ENGINEERING – College Prep **Year long**

This course is designed for students to acquire the tools they need to succeed in this class and in additional high school and college level science courses. This course will focus on Tools of the Trade (trimester 1), Materials Science (trimester 2) and Experimental Design (trimester 3).

Grade 9

SCIENCE and ENGINEERING - Advanced **Year long**

At this level, students will be expected to set up mathematical relationships from data obtained in the lab and then discuss how various types of experimental errors will affect the calculated results. This course will focus on Tools of the Trade (trimester 1), Materials Science (trimester 2) and Experimental Design (trimester 3). Students are expected to be able to read for content and comprehension. Students will be expected to develop a high level of independence in setting up data and coming to conclusions through the use of outside projects and reports.

Grade 9

SCIENCE and ENGINEERING - Honors **Year long**

This course is designed for science oriented students and will include detailed lab work, class discussion, outside reading and projects. Students will move at a vigorous pace and focus on Tools of the Trade (trimester 1), Materials Science (trimester 2) and Experimental Design (trimester 3). Students in this class are expected to have a high aptitude in mathematics and be highly motivated,

Grade 9

Biology

Biology stresses the development of investigative skills using the "inquiry" approach. In covering cell biology, diversity among living things, comparative anatomy and physiology, genetics and ecology, students learn to form hypotheses, collect data and analyze results.

BIOLOGY - College Prep **Year long**

This class will teach a wide breadth of topics and labs, with some depth and a more qualitative vs. quantitative analysis. Students will investigate the major kingdoms of life, cells, genetics and ecology. This is a college preparatory class.

Grades 10, 11

BIOLOGY - Advanced **Year long**

This class will take the topics discussed in Biology – College Prep and apply the use of quantitative data collecting techniques, along with more detailed lab procedures. Some of the topics that will be discussed include the kingdoms of life, cells, genetics and ecology. Students are expected to be able to read for content and comprehension.

Grades 10, 11

BIOLOGY - Honors **Year long**

This class is designed for college bound/science-oriented students and will include detailed lab work, class discussion, outside reading and projects. Biology-Honors is different from Biology – College Prep and Biology - Advanced in the following ways: amount of detail, outside class work and speed/depth at which topics are learned.

Grades 10, 11

ADVANCED PLACEMENT BIOLOGY - Honors **Year long**

This course is a second year biology course and is designed to be the equivalent of a college introductory biology course. After showing themselves to be qualified on the AP Examination, some students, as college freshmen, are permitted to undertake upper-level biology courses. This AP course is divided into four big ideas: evolution, biological systems and energy, information essential to life, and interactions. Due to the difficult labs and large amount of material on the exam, summer work and extra sessions will take place throughout the school year.

Prerequisites: Biology

AP Chemistry or Honors Chemistry - may be taken concurrently

Grades 11, 12

Environmental Science

ENVIRONMENTAL SCIENCE – College Prep w/Advanced option **Year long**

ES is an option for students who want to learn environmental science at the high school level or want to complete an upper level year of science that isn't math based. Ecological principles, population studies, geology, climate, pollution problems, and earth's resources are part of what is studied. This is a slower paced course than AP Environmental Science and has lesser requirements. Students can register for college prep or advanced credit, which would have a few more requirements.
Participation in an overnight field trip to an environmental learning center is also available but not required.
Approximate cost: $130.00.

Prerequisite: Biology

Grades 11, 12

ADVANCED PLACEMENT ENVIRONMENTAL SCIENCE - Honors **Year long**

APES is a year long course designed to be the equivalent of a college environmental science course. Ecological principles, population studies, geology, pollution problems, earth's resources, environmental policy environmental engineering and land management issues are part of what is studied. After showing themselves to be qualified on the AP Examination, some students can receive college credit. Some outdoor field trips are required, as well as a summer assignment.
There is a $130.00 fee for this course that covers the cost of an overnight field trip to an environmental learning center. Costs for other daily field trips will be handled on a trip-by-trip basis (i.e.: Minnesota Zoo).

Prerequisite: Chemistry (or concurrent with this course)

Grades 11, 12

Human Anatomy

HUMAN ANATOMY AND PHYSIOLOGY – Advanced **Year long**

In this year long course students will focus on the human body. Through lab work, lectures, readings and discussions, students will consider the structure and function of human body systems. Students will investigate the tissues, organs and organ systems of the human body - skeletal, muscular, digestive, circulatory, respiratory, excretory, nervous, endocrine and reproductive. In addition to the normal functions, students will consider diseases or problems related to these systems.

Prerequisite: Biology

Grades 10, 11, 12

UNIVERSITY OF MINNESOTA COLLEGE IN THE SCHOOLS PROGRAM (CIS) **Year long**
HUMAN ANATOMY AND PHYSIOLOGY - Honors

Online link: https://cce.umn.edu/human-physiology-technology-and-medical-devices
In this year long course students will examine specific topics in human anatomy and physiology, such as fitness and disease and body systems such as the respiratory, muscular, and cardiovascular systems. Students engage in a wide range of learning, problem solving and analysis, anatomical model building and inquiry-based activities.

This course will fulfill one freshman-level college semester in anatomy and physiology. Students taking this course will be required to attend two lecture activities off campus. Upon completion of the course and earning a C or higher, the U of MN will award 4 credits of "Science with a lab." This will be on official transcripts and will be honored at over 90% of universities in the United States. The U of MN strongly encourages an average of B- or higher in Chemistry (any level) as the prerequisite. CDH students may take any level Chemistry concurrently with this course.

College in the Schools is accredited by the National Alliance of Concurrent Enrollment Partnerships. Accreditation guarantees that courses offered through CIS are University of Minnesota courses and CIS students earn University of Minnesota credit. High school students taking U of MN courses through CIS are held to the same academic standards as students on the University campus. High school teachers teaching U of MN courses through CIS are selected, trained, and continuously

supported by University faculty. *The fee in 2016-2017 was $145.00. The University of Minnesota has not yet determined the fee for the upcoming school year.*

Prerequisite: Biology-Advanced or Biology-Honors

Grades 11, 12

Chemistry

Chemistry involves a study of the structures of molecules, the reactions they undergo and the forces, which drive these reactions. Emphasis will be given to the development of qualitative and quantitative methods in both lectures and labs. Students who plan to go on into any medical or science-related field need Chemistry. It is part of the normal college-preparatory sequence. Some colleges (including the University of Minnesota) require it as a prerequisite for the introductory college course.

LIVING BY CHEMISTRY **Year long**

Living by Chemistry is a course that is designed to explore the real-life applications of chemistry in every day life. It is a "hands-on" course structured around real-life scenarios. Students will study topics such as: scientific communities, water, petroleum, etc., with an emphasis on real-life skills and applications. Students taking this course can expect to complete performance based assessments such as: mock trials, designing original solutions to problems and creating original works that incorporate the chemistry principle learned in class. Participation in class discussions, working with others in a group, participation in laboratory activities and learning how to use research tools are key components of this course.

Prerequisite: Algebra 1

Grades 11, 12

CHEMISTRY – Advanced **Year long**

This course stresses both the qualitative and quantitative aspects of chemistry. Students will examine chemical principles in lab and discuss both theoretical and practical applications of these principles.

Requisite: Students in this course must be taking Alg2Trig concurrently

Grades 11, 12

CHEMISTRY – Honors **Year long**

This course covers the content of regular chemistry but at a faster pace and at greater depth. Some additional topics, including some organic chemistry, will be introduced. Students in the honors level course should be capable of getting at least a B in a college prep or honors sequence math program.

St. Mary's University has approved Chemistry - Honors as part of its Program for Advanced College Credit (PACC). Students who take Chemistry - Honors and maintain a "C" average in this class may earn from St. Mary's four college credits. These credits are transferable to approximately sixty other colleges and universities.

Requisite: Students in this course must be taking Alg2Trig - Advanced or Alg2Trig - Honors concurrently.

Grade 10 students are required to participate in an intensive twenty-hour summer session.

Grades 11, 12

ADVANCED PLACEMENT CHEMISTRY **Year long**

Chemistry is a first year chemistry course designed to cover the topics introduced in a first year college Chemistry course. A college level textbook is used, chemical calculations are more involved and laboratory work is of a greater variety. The course seeks to enable students to succeed in a first year college chemistry course or to have the opportunity to take other science courses where a first year course is a prerequisite.

Grade 10 students by department recommendation. These students are required to participate in an intensive twenty-hour summer session.

Grades 11, 12

Physics

Physics is the study of motion, forces, work, energy, electricity and magnetism, optics and sound. Physics is fundamental to the other sciences and is useful in understanding many everyday situations. Problem solving is emphasized, not the memorization of scientific facts and formulas. Completion of Chemistry is recommended and students should have a working knowledge of algebra, geometry, and trigonometry.

PHYSICS – Advanced **Year long**

This course will emphasize both conceptual and mathematical understanding of the Physics topics that are listed above. Practical applications will be made in all topics. Concurrent enrollment in a math class is recommended. The completion of Chemistry is also recommended.

St. Mary's University has approved Physics - Advanced as part of its Program for Advanced College Credit (PACC). 11th and 12th grade students who take Physics - Advanced and maintain a "C" average in this class may earn from St. Mary's three college credits. These credits are transferable to approximately sixty other colleges and universities.

The college credits for this class can be used to meet a science requirement at most colleges, but will not be accepted for students who plan to continue in a scientific program of study. Students who are interested in a scientific career and want college credit should enroll in AP Physics.

Grades 11, 12

UNIVERSITY OF MINNESOTA COLLEGE IN THE SCHOOLS ENTRY POINT PROGRAM (EPP)

PHYSICS BY INQUIRY – Advanced **Year long**

Online link: https://cce.umn.edu/physics-inquiry

In this year long course, students will get an in depth experience involving electricity and light/optics. The course will also discuss the impact on the environment and future. Students will be working together to solve problems using inquiry based activities and data analysis, focusing on student driven discovery. This course is meant for students who do NOT plan on going into engineering or science-related fields.

This course will fulfill one freshman-level college semester in science. Upon completion of the course and earning a C or higher, the U of MN will award 4 credits. This will be on official transcripts and will be honored at over 90% of universities in the United States.

College in the Schools Entry Point Program (EPP) is accredited by the National Alliance of Concurrent Enrollment Partnerships. Accreditation guarantees that courses offered through CIS are University of Minnesota courses and CIS students earn University of Minnesota credit. High school students taking U of MN courses through CIS are held to the same academic standards as students on the University campus. High school teachers teaching U of MN courses through CIS are selected, trained, and continuously supported by University faculty.

The fee in 2016-2017 was $145.00. The University of Minnesota has not yet determined the fee for the upcoming school year.

Prerequisite: The U of MN strongly encourages an average of B- or higher in Chemistry (any level) as the prerequisite.

Grades 11, 12

PHYSICS – Honors **Year long**

This course covers the topics listed above, and some others. It moves at a college pace, and the depth is that of a college course for non-majors in a scientific or engineering field.

St. Mary's University has approved Physics - Honors as part of its Program for Advanced College Credit (PACC). 11th and 12th grade students who take Physics - Honors and maintain a "C" average in this class may earn from St. Mary's three college credits. These credits are transferable to many other colleges and universities.

The college credits for this class can be used to meet a science requirement at most colleges, but will not be accepted for students who plan to continue in a scientific program of study. Students who are interested in a scientific career and want college credit should enroll in AP Physics.

Students not seeking the St. Mary's credit will be well prepared for college physics. Strong math skills are essential for success in this course. Concurrent enrollment in a math class is required, with calculus suggested as the most beneficial.

Chemistry recommended

Grades 11, 12

ADVANCED PLACEMENT PHYSICS - Honors **Year long**

This is a course in introductory physics intended for students who plan on majoring in science or engineering in college, or those who seek to challenge themselves at a very high level. The mathematical background required of the student is completion of or concurrent enrollment in introductory calculus. (There can be no exception to this requirement.) Completion of Honors Chemistry is strongly recommended.

The main objectives of the course are: to provide the student with a clear understanding of the concepts and principles of physics; to strengthen this understanding through real-world application of these concepts; to demonstrate the role of physics in other disciplines; to prepare for the Physics C examination, the passing of which results in college credit at participating colleges and universities.

The course can be divided into two categories: Newtonian mechanics (first half year) and Electricity and Magnetism (second half year). Each half-year is equivalent to a semester of college calculus level physics. The student will be eligible to take the AP exam for one or both of the topics, and credit for each semester is awarded individually.

Co-requisites: Calculus must be taken concurrently.

Credit will be awarded only after completion of AP Physics.

Grade 12

Trimester Electives

Students may take one, two or all three of these astronomy courses.

Astronomy can be taken for college prep or advanced credit.

ASTRONOMY: SOLAR SYSTEM AND THE VAGABONDS – College Prep **Tri I**

ASTRONOMY: SOLAR SYSTEM AND THE VAGABONDS - Advanced **Tri I**

This one trimester course will challenge your ideas about the sky and Universe. You may think you have learned all there is in elementary school, but there is so much more to comprehend. The content of this course will enrich your knowledge of the skies and challenge your mind to conceive of things that are out of reach! The solar system includes studying the planets and moons as well as vagabond asteroids and comets.

See Ms. Aumann if you have any questions.

Grades 11, 12

ASTRONOMY: STARS AND CONSTELLATIONS – College Prep **Tri II**
ASTRONOMY: STARS AND CONSTELLATIONS - Advanced **Tri II**

This one trimester course will challenge your ideas about the sky and Universe. You may think you have learned all there is in elementary school, but there is so much more to comprehend. The content of this course will enrich your knowledge of the skies and challenge your mind to conceive of things that are out of reach! This course will look at stars and their life cycles and electromagnetic radiation along with constellations and their mythology.

See Ms. Aumann if you have questions.

Grades 11, 12

ASTRONOMY: DEEP SPACE AND BEYOND – College Prep **Tri III**
ASTRONOMY: DEEP SPACE AND BEYOND - Advanced **Tri III**

This one trimester course will challenge your ideas about the sky and Universe. You may think you have learned all there is in elementary school, but there is so much more to comprehend. The content of this course will enrich your knowledge of the skies and challenge your mind to conceive of things that are out of reach! This course will study the Milky Way and other galaxies, quasars, energy sources, cosmology, space-time, black holes, the Big Bang and the search for extraterrestrials. This course is available for advanced credit. See Ms. Aumann if you have any questions.

Grades 11, 12

DNA, FORENSICS & GENETICS - College Prep or Advanced **Tri II**

This is primarily a lab course. Students learn sterile technique, plant tissue culture, DNA extraction, colony transformation, culturing and staining of bacteria as well as oral and airborne bacteria, in foods, antibiotics and bactericides and the development of resistant strains.

Advanced credit is available to students who complete an additional project. This advanced option must be declared officially by the tenth day of trimester 2 and the option may not be changed after this deadline.

Prerequisite: Biology

Grades 11, 12

OUTDOOR EDUCATION **Tri I or Tri II or Tri III**

Outdoor Education will bridge multiple intelligences by combining practical science knowledge with a diversity of experiences to help students understand themselves and their environment better. Students will use "real experiences" to help them understand their natural surroundings and ways to enjoy them. This class will include on-the-water sports, shooting sports, and adventure challenges and the applicable science concepts that go with them.

In addition to meeting for one class period each day, students are required to participate in 40 hours of Active Learning outside of school. Students will receive 2 trimester credits: 1 Physical Education credit and 1 Science credit. Students interested in taking this class more than one trimester, can take the classes in trimesters 1 and 2 **or** trimesters 2 and 3.

Some activities will require fees.

Grades 11, 12