MATHEMATICS AND COMPUTER SCIENCE

Mathematics Program Description

The study of mathematics has occupied humans from ancient times to the present. It is an intellectual process requiring creativity, analysis, logic, decision-making, synthesis of ideas, and communication. Mathematics exists in and for itself but also provides the technical basis for problem-solving in a wide variety of fields. Saint Mary's graduates equipped with a strong mathematical background will be in the enviable position of being able to utilize their expertise in areas where rigorous thought and precision of results are necessary.

The courses in mathematics are offered for those studying the subject as part of a liberal education; for majors as a preparation for graduate studies, careers in business, or industry; and for those who intend to teach mathematics. In addition to the Major in Mathematics, we offer four tracks for those with special interests. The Statistical and Actuarial Mathematics Major is a sequence of courses giving the student experience in statistics with an emphasis on risk modeling and is recognized by the Society of Actuaries as a pre-actuarial program. The Computing and Applied Mathematics Major enables those students with a strong interest in computer science to pursue an integrated program of mathematics and computer science. Similarly, the Physics and Applied Mathematics Major enables those students with interests in physics and mathematics to pursue both. The Mathematics Major with Teacher Concentration enables the student to obtain secondary school certification in the State of Indiana.

Computer Science Program Description

Courses in computer science are designed to educate students of the liberal arts in computer literacy; to provide computer programming instruction for students of mathematics, science, business and social science; and to establish a solid foundation in computer software theory and practice for students of all disciplines. The College offers a major in Computing and Applied Mathematics that combines mathematics and computer science (see above), a concentration in Management Information Systems within the Business Administration major (see Business Administration and Economics), and a minor.

STUDY ABROAD

Saint Mary's has a long history of providing quality international programs as an essential part of our educational mission—forming women leaders who will make a difference in the world. As this world becomes increasingly interdependent, the College offers an expanding range of semester, year, semester break, and summer study and service programs in a wide variety of countries, and encourages students to take advantage of them. Learn more about the various Study Abroad opportunities (https://catalog.saintmarys.edu/undergraduate/academic-life/international-programs/).

For math majors, there is a unique opportunity to study abroad in the Budapest Semesters in Mathematics program. Students wishing to study abroad through this program may do so any semester or over the summer after they have completed either MATH 341 Analysis I or MATH 353 Abstract Algebra I (though exceptions have been made).

Teacher Preparation

The Department encourages students to prepare for teaching on all levels. Through the Teacher Concentration, courses are provided which enable mathematics majors to fulfill Indiana secondary teaching certification requirements. Students interested in secondary teaching should also complete a Secondary Education major (see Education). Elementary education students may take courses leading to a mathematics minor or a double major in mathematics and elementary education.

4+1 in Data Science

Any of the majors in mathematics and computer science can be combined with the Masters of Science in Data Science so that a student can complete the requirements for an undergraduate degree and the M.S. in Data Science in five years. Interested students should consult the director of the Data Science Program to develop a five-year plan. For the M.S. in Data Science program and course descriptions, see the M.S. in Data Science in the Graduate Studies section of the Bulletin.

Programs

- Computer Science, Minor - CPSC (https://catalog.saintmarys.edu/undergraduate/programs/mathematics-computer-science/computer-science-minor/)
- Computing and Applied Mathematics, Bachelor of Arts - CAM (https://catalog.saintmarys.edu/undergraduate/programs/mathematics-computer-science/computing-applied-mathematics-bachelor-arts/)
- Computing and Applied Mathematics, Bachelor of Science - CAM (https://catalog.saintmarys.edu/undergraduate/programs/mathematics-computer-science/computing-applied-mathematics-bachelor-science/)
- Mathematics Teacher Concentration, Bachelor of Arts - MATC (https://catalog.saintmarys.edu/undergraduate/programs/mathematics-computer-science/mathematics-teacher-concentration-bachelor-arts/)
- Mathematics Teacher Concentration, Bachelor of Science - MATT (https://catalog.saintmarys.edu/undergraduate/programs/mathematics-computer-science/mathematics-teacher-concentration-bachelor-science/)
- Mathematics, Bachelor of Arts - MATH (https://catalog.saintmarys.edu/undergraduate/programs/mathematics-computer-science/mathematics-bachelor-arts/)
- Mathematics, Bachelor of Science - MATH (https://catalog.saintmarys.edu/undergraduate/programs/mathematics-computer-science/mathematics-bachelor-science/)
- Mathematics, Minor - MATH (https://catalog.saintmarys.edu/undergraduate/programs/mathematics-computer-science/mathematics-minor/)
- Mathematics/Computer Science, Minor - MTHC (https://catalog.saintmarys.edu/undergraduate/programs/mathematics-computer-science/mathematics-computer-science-minor/)
- Physics and Applied Mathematics, Bachelor of Arts - PAM (https://catalog.saintmarys.edu/undergraduate/programs/mathematics-computer-science/physics-applied-mathematics-bachelor-arts/)
- Physics and Applied Mathematics, Bachelor of Science - PAM (https://catalog.saintmarys.edu/undergraduate/programs/mathematics-computer-science/physics-applied-mathematics-bachelor-science/)

- Statistical and Actuarial Mathematics, Bachelor of Arts - SAM (https://catalog.saintmarys.edu/undergraduate/programs/mathematics-computer-science/statistical-actuarial-mathematics-bachelor-arts/)
- Statistical and Actuarial Mathematics, Bachelor of Science - SAM (https://catalog.saintmarys.edu/undergraduate/programs/mathematics-computer-science/statistical-actuarial-mathematics-bachelor-science/)

Continue at Saint Mary's

- Data Science, Master of Science (https://catalog.saintmarys.edu/graduate/programs/data-science-master/)

Department Chair

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Faculty

Mathematics Faculty

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Computer Science Faculty

S. Cox, E. Misiolek, N. Salehi, C. Wedrychowicz

Student Learning Outcomes

- The graduate will demonstrate depth and breadth of knowledge of mathematical concepts, methods, reasoning, and language.
- The graduate will be able to engage in independent learning, application, and problem solving.
- The graduate will be able to communicate their ideas and the results of their work, both orally and in writing, with clarity and precision.
- The graduate will recognize the importance of social and ethical issues in professional settings.
- The graduate will be prepared for a career path that requires mathematical understanding.
- The graduate will be prepared to be a contributing member of a problem solving team.
- The graduate will utilize appropriate technology for analysis and problem solving.
- The graduate will have developed an appreciation for the power and beauty of mathematics.

Mathematics Courses

MATH 100 Problem-Solving Strategies in Mathematics (3)
Intensive study of the problem-solving process. Algebraic, patterning, modeling, and geometric strategies are explored. Includes a review of basic algebra skills and concepts necessary for problem solving. Consent of the Department is required. This does not fulfill the Mathematical Arts requirement of the Sophia Program.

MATH 102 Liberal Arts Mathematics (3)
Mathematical modeling through the use of graph theory. Topics include graphs, directed graphs, trees, matchings and network flows. Designed primarily for first year college students. Prerequisite: MATH 100 or recommendation of Math Placement Advisor.

MATH 103 Precalculus (3)
This course studies polynomial, rational, exponential, logarithmic, and trigonometric functions from the symbolic, numeric, and graphical perspectives. The emphasis on these concepts will provide solid preparation for a college-level calculus course. This does not fulfill the Mathematical Arts requirement of the Sophia Program. Prerequisite: recommendation of Math Placement Advisor.

MATH 104 Finite Mathematics (3)
Set theory, counting techniques, probability, random variables, expected value, variance, standard deviation, and linear programming. Prerequisite: MATH 102 or recommendation of Math Placement Advisor.

MATH 107 Mathematics for Sustainability (3)
This course develops and applies mathematical concepts and tools to quantitatively explore sustainability issues. Topics such as industrial agriculture, energy sustainability, population growth, and ecological footprints will be explored from environmental, social, and economic perspectives wherever possible. Mathematical concepts developed in the course are motivated through the study of these topics and allow students to survey several mathematical areas. Particular concepts covered include properties of real numbers, algebraic simplification of expressions, solving equations and inequalities, rates of change, interpretation of numerical information, functions and inverses, modeling, differentiation/integration, qualitative analysis of differential equation models, calculating probabilities, statistical techniques on real data, and graph paths and connectivity.

MATH 108 Elements of Linear Algebra (3)
Matrices, systems of equations, determinants, eigenvalues, linear transformations, vector spaces. Emphasis on applications. Prerequisite: MATH 104 or MATH 113.

MATH 110 Modern Geometries (3)
Finite geometries. Transformational geometry with an introduction to fractals. Euclidean geometry, including classical constructions. Non-Euclidean geometries, including hyperbolic and/or projective geometry. Prerequisite: MATH 104 or MATH 105.

MATH 113 Survey of Calculus (4)
A one semester introduction to differential and integral calculus designed primarily for liberal arts students and those in the professional programs. An emphasis on applications and modeling. Prerequisites: MATH 103 or recommendation of Math Placement Advisor.

MATH 114 Introduction to Statistics (3)
Introduction to basic sampling and experimental design. Basics of probability, random variables, and probability distributions. Sampling distributions. Estimation and hypothesis testing for means and proportions. Statistical software will be used. Prerequisite: MATH 104 or MATH 113 or equivalent.

MATH 118 Patterns in Mathematics for Elementary Teachers (3)
Problem solving and strategies; properties of whole numbers, integers, rational numbers, and real numbers; algorithms and computation; elementary number theory. The course follows the recommendations of the Mathematical Association of America and the National Council of Teachers of Mathematics for the training of elementary teachers. Prerequisite: One Mathematical Arts Sophia Program course.

MATH 131 Calculus I (4)
The first course in a two course sequence with MATH 132. The two courses will cover the following topics: algebraic and transcendental functions; limits; continuity; derivatives; maxima and minima; concavity; related rates; Taylor polynomials; Mean Value Theorem; anti-differentiation; Riemann sums; the Fundamental Theorem of Calculus; techniques of integration; sequences and series. The course is based on graphical, numerical, and symbolic points of view. Graphing calculators are used throughout the course. Prerequisite: MATH 103 with a grade of "C" or higher, or recommendation of Math Placement Advisor.

MATH 132 Calculus II (4)
The second course in a two course sequence with MATH 131. The two courses will cover the following topics: algebraic and transcendental functions; limits; continuity; derivatives; maxima and minima; concavity; related rates; Taylor polynomials; Mean Value Theorem; anti-differentiation; Riemann sums; the Fundamental Theorem of Calculus; techniques of integration; sequences and series. The course is based on graphical, numerical, and symbolic points of view. Graphing calculators are used throughout the course. Prerequisite: At least four years of high school mathematics, or recommendation of Math Placement Advisor. Prerequisite: MATH 131.

MATH 133 Theory and Application of Calculus (4)
This course is designed for students who have completed a full year of calculus in high school and have mastered the mechanics of differentiation and integration. The basic concepts of a two-semester college calculus sequence, including limits, derivatives, integrals, sequences and series, will be explored in depth. The emphasis of the course is on understanding the theory of calculus and constructing mathematical models. Prerequisite: A minimum score of 3 on the AP Calculus exam, recommendation of Math Placement Advisor, or permission of instructor.

MATH 180 Mathematics of Voting (1)
This course in applied math and politics will focus on the mathematics behind voting in both two-party and multi-party systems, comparing systems in the US with those in France and Ireland. Students will explore both implemented and theoretical social choice functions and analyze each, subject to standard criteria. They will develop an understanding for how formal rules and procedures have an impact on policy outcomes and informal institutions such as political parties.

MATH 211 Elementary Number Theory (3)
Basic number theoretic concepts are studied, with an emphasis on writing proofs. Divisibility; primes; Euclid's algorithm and its consequences; linear diophantine equations; residue classes; linear congruences; arithmetic functions. Applications of number theory to computer science (cryptography, complexity of computations). Prerequisite: MATH 118 or MATH 131.

MATH 225 Foundations of Higher Mathematics (3)
Set theory, logic, relations, functions, and an introduction to abstract mathematical structures, with an emphasis on reading and writing mathematical proofs. Prerequisite: MATH 132 or 133, or permission of instructor.

MATH 231 Calculus III (4)
Three-dimensional space: parametric equations, lines, planes, vectors, dot product, cross product. Polar coordinates. Vector-valued functions. Functions of several variables: partial derivatives, linear approximation, gradient, directional derivatives, maxima, minima, chain rule. Multiple ntegrals. Vector Calculus (including Green's Theorem and Stokes' Theorem). Prerequisite: MATH 132 or MATH 133.

MATH 241 Statistical Applications (3)
Sampling studies, design of experiments, hypothesis testing, analysis of variance, regression and correlation, regression modeling, time series. Introduction to operations research: queuing, systems analysis, quality assurance, acceptance sampling. Emphasis on applications to business and economic decision making. Prerequisite: MATH 114 with a grade of "C" or higher (also listed as BUAD 341).

MATH 251 Principles of Operations Research (3)
An introduction to Operations Research—quantitative models used in management decision-making. The course will focus on the models as tools with computer software used extensively for problem solving and assignments. Case studies are used. Prerequisite: One year of Calculus or MATH 114 (also listed as BUAD 427).

MATH 252 Financial Mathematics (3)
Mathematical theory of interest, annuities, amortization schedules, yield rates, and sinking funds. Prerequisite: Two semesters of calculus or equivalent or permission of the instructor.

MATH 272 Women and Mathematics: Seminar (3)
This course has three major components: an overview of the history of mathematics, the lives and contributions of selected women mathematicians throughout history, and the experiences of women in the contemporary mathematical community. In our general exploration of history, we focus on the development of mathematical ideas and the contributions made by various cultures and individuals. Among the historical figures studied in depth are Hypatia, Maria Agnesi, Sophie Germain, Sofia Kovaleskaia, Emmy Noether, Julia Robinson. The course will examine the ways in which the views of the modern mathematical community and the broader society discourage or encourage the participation of women and other under-represented groups in mathematics. Prerequisite: One semester of college-level calculus or equivalent.

MATH 302 Mathematics for Elementary School Teachers (3)
Review of basic properties of the real number system. Foundations of Euclidean geometry with additional study of transformational geometry. Elementary probability and statistics. This course meets for two hours of class instruction and has a two-hour laboratory component. Recommendations of MAA and NCTM are continued. Prerequisite: Two MATH courses including MATH 118 with a grade of C or higher in MATH 118.

MATH 326 Linear Algebra and Differential Equations (4)
Linear systems; linear independence; matrix algebra; determinants; vector spaces including subspaces, dimension, rank, change of bases; linear transformations; eigenvalues and eigenvectors; inner product; orthogonality; and Gram-Schmidt. An introduction to differential equations, including first order linear, separable, and exact; second order with constant coefficients and variation of parameters, reduction of order, and undetermined coefficients. Applications included. Prerequisites: MATH 231.

MATH 335 Differential Equations II (3)
A study of methods for solving higher order linear ordinary differential equations, linear first order systems, and boundary value problems for the heat and wave equations. Analysis of nonlinear systems of first order ordinary differential equations using approximation by linear systems, numerical solutions and phase portraits. The course will use mathematical software to solve differential equations and systems of differential equations symbolically, numerically and graphically. Prerequisite: MATH 326.

MATH 336 Numerical Analysis (3)
Computer arithmetic and algorithm convergence. Solutions of equations. Optimization. Numerical linear algebra. Numerical solutions to ordinary differential equations. Numerical differentiation and integration. Error analysis. Prerequisite or corequisite: MATH 326.

MATH 339 Discrete Mathematics (3)
Introduction to graph theoretic and combinatoric models: planar graphs; circuits; spanning trees; network flows; counting; generating functions; recurrence relations. Prerequisites: MATH 225 and CPSC 207.

MATH 341 Analysis I (3)
Construction of the reals; Sequences; Real valued functions of a single real variable: continuity, uniform continuity, sequences and series of functions, uniform convergence, differentiation, integration. Prerequisites: MATH 225 and MATH 231.

MATH 342 Analysis II (3)
Construction of the reals; Sequences; Real valued functions of a single real variable: continuity, uniform continuity, sequences and series of functions, uniform convergence, differentiation, integration. Prerequisite: MATH 341.

MATH 345 Probability (3)
A calculus-based approach to probability theory. Topics include probability spaces, classical theory, random variables, discrete and continuous distributions, multivariant distributions, transformations of random variables, random sampling, the law of large numbers, the central limit theorem and moment generating functions. Prerequisite: MATH 231 or equivalent.

MATH 346 Statistics (3)
Topics include sampling distributions, estimation, theory of estimators, test of hypotheses, analysis of variance, regression and correlation analysis, time series, experimental design, modeling and decision criteria. The use of statistical analysis in decision problems is stressed. Prerequisite: MATH 345 or equivalent.

MATH 353 Abstract Algebra I (3)
Basic algebraic systems: groups, rings, and fields. Homomorphisms and factor groups, rings. Polynomial rings and field extensions. Applications, including symmetry groups and algebraic coding theory. Prerequisite: MATH 225 and MATH 326.

MATH 354 Abstract Algebra II (3)
Basic algebraic systems: groups, rings, and fields. Homomorphisms and factor groups, rings. Polynomial rings and field extensions. Applications, including symmetry groups and algebraic coding theory. Prerequisite: MATH 353.

MATH 361 Geometry (3)
Historical and formal development of Euclidean and non-Euclidean geometries; role of axiom systems; congruence, parallelism, measurement. Prerequisite: MATH 225.

MATH 372 Stochastic Models (3)
Stochastic models of contingent payment, survival, frequency, severity and ruin. Compound distribution models. Emphasis on application to actuarial models. Prerequisite: MATH 345.

MATH 381 Mathematical Modeling (3)
In this course, students study the modeling process with application from difference equations, probability, dynamical systems, optimization, and simulation. Students will design, develop, implement, evaluate, and present mathematical models using real data for observable phenomena. Models and issues related to environmental and sustainability studies are emphasized. Prerequisites: MATH 326 and MATH 345.

MATH 388 BIG (Business, Industry, Government) Problems in Mathematics (3)
We focus on solving problems provided to us by partner organizations in business, industry, or government (BIG). Students develop their technical skills (mathematics, statistics, programming) as well as skills valued by employers of STEM professionals: teamwork, written and oral communication, independent problem solving, and meeting deadlines. This course is based on the PIC Math (Preparation for Industrial Careers in Mathematics) model developed by the Mathematical Association of America. Prerequisites: Math 231 and CPSC 207, or permission of instructor.

MATH 390 Special Topics (1-4)
Topics in Mathematics not covered in the regular department offerings. May be repeated with a different topic.

MATH 438 Mathematical Programming (3)
Topics include model building; classical optimization; linear programming; non-linear programming. Prerequisite: MATH 231, MATH 326 and junior or senior status.

MATH 490 Special Topics (1-3)
Topics in Mathematics not covered in the regular department offerings. May be repeated with a different topic.

MATH 496 Pro-Seminar (2)
Student presentation of selected topics. Prerequisite: Permission of the department chair.

MATH 497 Independent Study (1-3)
Provides properly qualified students with an opportunity for independent study and careful consideration from an advanced standpoint of selected topics in undergraduate mathematics. Prerequisite: Permission of the department chair. May be repeated.

MATH 499 Internship (1-3)
Professional work experience in mathematics or statistics with a business or organization. May be repeated.

Computer Science Courses

CPSC 102 Spreadsheets (1)
This course introduces the student to an integrated spreadsheet application. Topics covered include: cell formulas and built-in functions, formatting, charting, templates, "what-if" analysis, pivot tables, macros and integration of spreadsheet data into a word processor. Graded S/U.

CPSC 103 Introduction to Computing (2)
This course includes a brief history of computing, uses of computers in networking and programming, and ethical issues in computing. Students learn to use a database application as they create and manipulate tables, forms, queries, reports, macros and other database objects.

CPSC 207 Computer Programming (3)
This course explores program development and design with objects; the designs are implemented in a commonly used, current programming language. The emphasis is on designing, writing, and correcting programs. Topics include the internal organization of the computer, procedures and functions, elementary data structures, and techniques of problem solving. No previous experience with computers is required. The course is focused around a weekly two-hour laboratory and provides in-depth programming experience.

CPSC 207L Computer Programming Laboratory (0)
A weekly two-hour laboratory and provides in-depth programming experience.

CPSC 210 Introduction to Data Science (3)
This course is about learning from data in order to gain useful predictions and insights. Using concepts from computer science, mathematics, and statistics, students will learn the necessary skills to manage and analyze data, including exploratory data analysis, statistical inference and modeling, and machine learning. Prerequisites: CPSC 207 (or equivalent) and one semester of calculus (MATH 113 or 131 or equivalent). Includes lab.

CPSC 210L Introduction Data Science Lab (0)

CPSC 307 C and Assembly Language Programming (3)
This course is designed to deepen a student's understanding of how a computer works by studying the C programming language and how it interfaces with assembly language. A weekly laboratory provides experience in controlling the behavior of the computer in ways not possible in higher level languages. Topics include computer organization, assemblers, loaders, link editors, and memory management. Prerequisite: CPSC 207 or equivalent.

CPSC 308 Electronic Communications (3)
This introduction to data communications examines the fundamentals of network architecture including layers, protocols, client/server model, file transfers, and other low-level communications issues. Students will experience hands-on internet related programming including web page development using HTML, and CSS. Prerequisites: CPSC 207 or permission of instructor. Includes a lab.

CPSC 308L Electronic Communications Lab (0)
Corequisite CPSC 308

CPSC 315 Simulation: Theory and Application (3)
Theory of computer simulation, including applications of discrete models of industrial and management systems. Topics include probability distributions, random number generation, queuing, design, and analysis of simulation experiments. Includes significant use of simulation software. Prerequisites: CPSC 207 and either MATH 114 or MATH 345.

CPSC 328 Data Structures (3)
This course introduces the concepts and techniques of structuring data for complex problems, and provides experience in accessing and processing this data. An object-oriented paradigm is used throughout the course. The course is designed especially for students who will choose a career in information technology. Prerequisite: CPSC 207. Includes a lab.

CPSC 328L Data Structures - Lab (0)

CPSC 390 Special Topics (3)

CPSC 417 Systems Analysis and Design (4)
This course includes a study of systems, particularly those which lend themselves to computer representation, a study of systems analysis and design, and the completion of a major systems project done in a team environment. The project will involve the analysis of an actual system problem, the writing of a system proposal to solve the problem, the presentation of the proposal to the users of the system, and the design and construction of a prototype to implement the proposal. Prerequisite: CPSC 207 or permission of instructor.

CPSC 417L Systems Analysis & Design lab (0)
CPSC 417 lab

CPSC 429 Database Systems (3)
Fundamental concepts of database development, in particular data modeling, database design, and database implementation, as well as managing, retrieving, and updating data within a relational database system. Hands-on experience includes use of the Structured Query Language (SQL) to define, construct, and query a database. Students complete a semester-long project done in a team environment. Prerequisite: CPSC 207 or permission of instructor.

CPSC 497 Independent Study (1-3)
Provides properly qualified students with an opportunity for independent study and careful consideration from an advanced standpoint of selected topics in computer science. Departmental approval required. May be repeated.

CPSC 499 Internship (1-3)
Professional work experience in computer science with a business or organization. Graded S/U. May be repeated.

Four-Year Plans in Mathematics and Computer Science Majors

The Mathematics and Computer Science Department offers five different majors:

a. Computing and Applied Mathematics - Even year start (p. 5) or Odd year start (p. 6),

b. Mathematics Teacher Concentration - Even year start (p. 7) or Odd year start (p. 8),

c. Mathematics - Even year start (p. 8) or Odd year start (p. 9),

d. Physics and Applied Mathematics - Even year start (p. 9) or Odd year start (p. 10),

e. Statistical and Actuarial Mathematics - Even year start (p. 11) or Odd year start (p. 11).

Recommended four-year plans are provided for each major. There are two plans provided for each major depending on whether the first year begins in an even or odd year. We emphasize that these plans are *recommendations for a possible path to graduation* as there exists flexibility in specific courses due to scheduling and elective choices. Course recommendations that may be altered regarding timing or selection are noted next to the course in the following plans. Students should contact Mandy Gair, agair@saintmarys.edu, to be assigned an advisor in the Department in order to develop an individualized four-year plan. Also note that any major can be completed as Bachelor of Arts (BA) or Bachelor of Science (BS) degree. There is no difference in the required CPSC, MATH, or PHYS courses for a given major between the BA or BS degree, but any student pursuing a BS will need to add science credits other than MATH or CPSC.

Computing & Applied Mathematics (CAM) – EVEN Year Start

Course	Title	Credits
First Year		
First Semester		
MATH 131	Calculus I (Sophia Mathematical Arts)	4
SPLL 101 First-Year Common Course		
Sophia Language I (4cr)		
CTS or W (3cr/4cr)		

Sophia course (3cr)

		Credits	4

Second Semester

CPSC 207	Computer Programming (Sophia Professional Arts. Course recommendations that may be altered)	3
MATH 132	Calculus II	4

Sophia Language II (4cr)

CTS or W (3cr/4cr)

Sophia course (3cr)

		Credits	7

Second Year

First Semester

MATH 225	Foundations of Higher Mathematics (Course recommendations that may be altered)	3
MATH 231	Calculus III	4

Sophia courses (3cr)

Sophia courses (3cr)

Elective course (3cr)

		Credits	7

Second Semester

CPSC 328	Data Structures (Course recommendations that may be altered)	3
MATH 326	Linear Algebra and Differential Equations	4

Sophia course (3cr)

Sophia course (3cr)

Elective course (3cr)

		Credits	7

Third Year

First Semester

CPSC 417	Systems Analysis and Design (Course recommendations that may be altered)	4
MATH 335 or MATH 353 or MATH 381	Differential Equations II (MATH 3xx elective) or Abstract Algebra I or Mathematical Modeling	3

Sophia course (4cr)

Elective courses (6cr)

		Credits	7

Second Semester

CPSC 308 or CPSC 315	Electronic Communications or Simulation: Theory and Application	3
MATH 339	Discrete Mathematics	3

Sophia course (3cr)

Elective courses (6cr)

		Credits	6

Fourth Year

First Semester

CPSC 429	Database Systems (Course recommendations that may be altered)	3

MATH 335 or MATH 341 or MATH 361	Differential Equations II (MATH 3xx elective (3cr)) or Analysis I or Geometry	3

Sophia course (3cr)

Elective courses (7cr)

		Credits	6

Second Semester

MATH 496	Pro-Seminar (Course recommendations that may be altered)	2
MATH 336 or MATH 342 or MATH 345	Numerical Analysis (MATH 3xx elective (3cr)) or Analysis II or Probability	3

Elective courses (10cr)

		Credits	5
		Total Credits	**49**

Computing & Applied Mathematics (CAM) – ODD Year Start

Course	Title	Credits
First Year		
First Semester		
MATH 131	Calculus I (Sophia Mathematical Arts)	4

SPLL 101 First-Year Common Course

Sophia Language I (4cr)

CTS or W (3cr/4cr)

Sophia course (3cr)

		Credits	4

Second Semester

CPSC 207	Computer Programming (Sophia Professional Arts. Course recommendations that may be altered)	3
MATH 132	Calculus II	4

Sophia Language II (4cr)

CTS or W (3cr/4cr)

Sophia course (3cr)

		Credits	7

Second Year

First Semester

MATH 225	Foundations of Higher Mathematics (Course recommendations that may be altered)	3
MATH 231	Calculus III (Course recommendations that may be altered)	4

Sophia courses (3cr)

Sophia courses (3cr)

Elective course (3cr)

		Credits	7

Second Semester

CPSC 308 or CPSC 315	Electronic Communications or Simulation: Theory and Application	3
MATH 326	Linear Algebra and Differential Equations	4
MATH 339	Discrete Mathematics (Course recommendations that may be altered)	3

Left column:

Sophia course (3cr)		
Elective course (3cr)		
	Credits	**10**

Third Year

First Semester

MATH 335 or MATH 341 or MATH 361	Differential Equations II (MATH 3xx elective (3cr)) or Analysis I or Geometry	3
CPSC 417	Systems Analysis and Design (Course recommendations that may be altered)	4
Sophia course (4cr)		
Elective courses (6cr)		
	Credits	**7**

Second Semester

CPSC 328	Data Structures	3
MATH 336 or MATH 342 or MATH 345	Numerical Analysis (MATH 3xx elective (3cr)) or Analysis II or Probability	3
Sophia course (3cr)		
Elective courses (6cr)		
	Credits	**6**

Fourth Year

First Semester

CPSC 429	Database Systems (Course recommendations that may be altered)	3
MATH 335 or MATH 346 or MATH 353 or MATH 381	Differential Equations II (MATH 3xx elective (3cr)) or Statistics or Abstract Algebra I or Mathematical Modeling	3
Elective courses (10cr)		
	Credits	**6**

Second Semester

MATH 496	Pro-Seminar (Course recommendations that may be altered)	2
Sophia course (3cr)		
Elective courses (10cr)		
	Credits	**2**
	Total Credits	**49**

Mathematics Teacher Concentration (MATC/MATT) – EVEN Year Start

Course	Title	Credits
First Year		
First Semester		
MATH 131	Calculus I (Sophia Mathematical Arts)	4
SPLL 101 First-Year Common Course		
Sophia Language I (4cr)		
CTS or W (3cr/4cr)		
Sophia course (3cr)		
	Credits	**4**

Right column:

Second Semester

CPSC 207	Computer Programming (Sophia Professional Arts. Course recommendations that may be altered)	3
MATH 132	Calculus II	4
Sophia Language II (4cr)		
CTS or W (3cr/4cr)		
Sophia course (3cr)		
	Credits	**7**

Second Year

First Semester

MATH 225	Foundations of Higher Mathematics (Course recommendations that may be altered)	3
MATH 231	Calculus III	4
Sophia course (3cr)		
Sophia course (3cr)		
Elective course (3cr)		
	Credits	**7**

Second Semester

MATH 326	Linear Algebra and Differential Equations	4
MATH 345	Probability	3
Sophia course (3cr)		
Sophia course (3cr)		
Elective course (3cr)		
	Credits	**7**

Third Year

First Semester

MATH 346	Statistics	3
MATH 353	Abstract Algebra I	3
Sophia course (4cr)		
Elective courses (6cr)		
	Credits	**6**

Second Semester

MATH 339	Discrete Mathematics	3
MATH 354	Abstract Algebra II (Course recommendations that may be altered)	3
Sophia course (3cr)		
Elective courses (6cr)		
	Credits	**6**

Fourth Year

First Semester

MATH 361	Geometry	3
MATH 496	Pro-Seminar	2
Sophia course (3cr)		
Elective courses (8cr)		
	Credits	**5**

Second Semester

Elective courses (16cr)		
	Credits	**0**
	Total Credits	**42**

Mathematics Teacher Concentration (MATC/MATT) – ODD Year Start

Course	Title	Credits
First Year		
First Semester		
MATH 131	Calculus I (Sophia Mathematical Arts)	4
SPLL 101 First-Year Common Course		
Sophia Language I (4cr)		
CTS or W (3cr/4cr)		
Sophia course (3cr)		
	Credits	**4**
Second Semester		
CPSC 207	Computer Programming (Sophia Professional Arts. Course recommendations that may be altered)	3
MATH 132	Calculus II	4
Sophia Language II (4cr)		
CTS or W (3cr/4cr)		
Sophia course (3cr)		
	Credits	**7**
Second Year		
First Semester		
MATH 225	Foundations of Higher Mathematics	3
MATH 231	Calculus III	4
Sophia course (3cr)		
Sophia course (3cr)		
Elective course (3cr)		
	Credits	**7**
Second Semester		
MATH 326	Linear Algebra and Differential Equations	4
MATH 339	Discrete Mathematics	3
Sophia course (3cr)		
Sophia course (3cr)		
Elective course (3cr)		
	Credits	**7**
Third Year		
First Semester		
MATH 341	Analysis I	3
MATH 361	Geometry	3
Sophia course (4cr)		
Elective courses (6cr)		
	Credits	**6**
Second Semester		
MATH 345	Probability	3
Sophia course (3cr)		
Elective courses (9cr)		
	Credits	**3**
Fourth Year		
First Semester		
MATH 346	Statistics	3
MATH 353	Abstract Algebra I	3
MATH 496	Pro-Seminar	2
Sophia course (3cr)		
Elective courses (5cr)		
	Credits	**8**
Second Semester		
Elective courses (16cr)		
	Credits	**0**
	Total Credits	**42**

Mathematics (MATH) – EVEN Year Start

Course	Title	Credits
First Year		
First Semester		
MATH 131	Calculus I (Sophia Mathematical Arts)	4
SPLL 101 (1cr)		
Sophia Language I (4cr)		
CTS or W (3cr/4cr)		
Sophia course (3cr)		
	Credits	**4**
Second Semester		
CPSC 207	Computer Programming (Sophia Professional Arts. Course recommendations that may be altered.)	3
MATH 132	Calculus II	4
Sophia Language II (4cr)		
CTS or W (3cr/4cr)		
Sophia course (3cr)		
	Credits	**7**
Second Year		
First Semester		
MATH 225	Foundations of Higher Mathematics (Course recommendations that may be altered)	3
MATH 231	Calculus III	4
Sophia courses (6cr)		
Elective course (3cr)		
	Credits	**7**
Second Semester		
MATH 326	Linear Algebra and Differential Equations	4
MATH 345	Probability (Course recommendations that may be altered)	3
Sophia courses (6cr)		
Elective course (3cr)		
	Credits	**7**
Third Year		
First Semester		
MATH 346	Statistics (Course recommendations that may be altered)	3
MATH 353	Abstract Algebra I (Course recommendations that may be altered)	3
Sophia course (4cr)		
Elective courses (6cr)		
	Credits	**6**

Second Semester

MATH 354	Abstract Algebra II (Course recommendations that may be altered)	3
MATH 339 or MATH 372	Discrete Mathematics (MATH 3xx elective. Course recommendations that may be altered.) or Stochastic Models	3
Sophia course (3cr)		
Elective courses (6cr)		
	Credits	**6**

Fourth Year

First Semester

MATH 341	Analysis I (Course recommendations that may be altered)	3
MATH 496	Pro-Seminar (Course recommendations that may be altered)	2
Sophia course (3cr)		
Elective courses (8cr)		
	Credits	**5**

Second Semester

Elective courses (16cr)		
	Credits	**0**
	Total Credits	**42**

Mathematics (MATH) – ODD Year Start

Course	Title	Credits
First Year		
First Semester		
MATH 131	Calculus I (Sophia Mathematical Arts)	4
	Credits	**4**
Second Semester		
CPSC 207	Computer Programming (Sophia Professional Arts. Course recommendations that may be altered)	3
MATH 132	Calculus II	4
Sophia Language II (4cr)		
CTS or W (3cr/4cr)		
Sophia course (3cr)		
	Credits	**7**
Second Year		
First Semester		
MATH 225	Foundations of Higher Mathematics (Course recommendations that may be altered)	3
MATH 231	Calculus III	4
Sophia courses (6cr)		
Elective course (3cr)		
	Credits	**7**
Second Semester		
MATH 326	Linear Algebra and Differential Equations	4
MATH 345	Probability (Course recommendations that may be altered)	3
Sophia courses (6cr)		

Elective course (3cr)

	Credits	**7**

Third Year

First Semester

MATH 341	Analysis I (Course recommendations that may be altered)	3
MATH 346	Statistics (Course recommendations that may be altered)	3
Sophia course (4cr)		
Elective courses (6cr)		
	Credits	**6**

Second Semester

MATH 342	Analysis II (Course recommendations that may be altered)	3
MATH 336 or CPSC 315 or CPSC 328	Numerical Analysis (MATH or CPSC 3xx elective (3cr) Course recommendations that may be altered) or Simulation: Theory and Application or Data Structures	3
Sophia course (3cr)		
Elective courses (6cr)		
	Credits	**6**

Fourth Year

First Semester

MATH 353	Abstract Algebra I (Course recommendations that may be altered)	3
MATH 496	Pro-Seminar (Course recommendations that may be altered)	2
Sophia course (3cr)		
Elective courses (8cr)		
	Credits	**5**

Second Semester

Elective courses (16cr)		
	Credits	**0**
	Total Credits	**42**

Physics & Applied Mathematics (PAM) – EVEN Year Start

Course	Title	Credits
First Year		
First Semester		
MATH 131	Calculus I (Sophia Mathematical Arts)	4
PHYS 121	General Physics I: Mechanics and Waves (Sophia Natural Science I)	4
Sophia Language I (4cr)		
CTS or W (3cr/4cr)		
SPLL 101 (1cr)		
	Credits	**8**
Second Semester		
MATH 132	Calculus II	4
PHYS 122	General Physics II: Temperature, Electricity, and Light (Sophia Natural Science I)	4
Sophia Language II (4cr)		

CTS or W (3cr/4cr)		
	Credits	**8**
Second Year		
First Semester		
CPSC 207	Computer Programming (Sophia Professional Arts.Course recommendations that may be altered)	3
MATH 225	Foundations of Higher Mathematics (Course recommendations that may be altered)	3
MATH 231	Calculus III	4
PHYS 253	General Physics III: Modern Physics	3
Sophia course (3cr)		
	Credits	**13**
Second Semester		
MATH 326	Linear Algebra and Differential Equations	4
MATH 345	Probability (Course recommendations that may be altered)	3
PHYS 292L	Wave Mechanics Laboratory (Course recommendations that may be altered)	1
PHYS 323	Classical Mechanics (PHYS elective. Course recommendations that may be altered)	3
Sophia courses (6cr)		
	Credits	**11**
Third Year		
First Semester		
MATH 346	Statistics (Course recommendations that may be altered)	3
PHYS 424	Quantum Mechanics (Course recommendations that may be altered)	3
Sophia course (3cr)		
Elective courses (6cr)		
	Credits	**6**
Second Semester		
PHYS 323	Classical Mechanics (Course recommendations that may be altered)	3
Sophia course (3cr)		
Elective courses (9cr)		
	Credits	**3**
Fourth Year		
First Semester		
MATH 335 or MATH 341	Differential Equations II (MATH 3xx elective. Course recommendations that may be altered) or Analysis I	3
Sophia course (3cr)		
Elective courses (10cr)		
	Credits	**3**
Second Semester		
MATH 496	Pro-Seminar (Course recommendations that may be altered)	2

Elective courses (14cr)		
	Credits	**2**
	Total Credits	**54**

Physics & Applied Mathematics (PAM) − ODD Year Start

Course	Title	Credits
First Year		
First Semester		
MATH 131	Calculus I (Sophia Mathematical Arts)	4
PHYS 121	General Physics I: Mechanics and Waves (Sophia Natural Science I: (4cr))	4
Sophia Language I (4cr)		
CTS or W (3cr/4cr)		
SPLL 101 (1cr)		
	Credits	**8**
Second Semester		
MATH 132	Calculus II	4
PHYS 122	General Physics II: Temperature, Electricity, and Light (Sophia Natural Science I: (4cr))	4
Sophia Language II (4cr)		
CTS or W (3cr/4cr)		
	Credits	**8**
Second Year		
First Semester		
CPSC 207	Computer Programming (Sophia Professional Arts. Course recommendations that may be altered)	3
MATH 225	Foundations of Higher Mathematics (Course recommendations that may be altered)	3
MATH 231	Calculus III	4
PHYS 253	General Physics III: Modern Physics	3
Sophia course (3cr)		
	Credits	**13**
Second Semester		
MATH 326	Linear Algebra and Differential Equations	4
MATH 345	Probability (Course recommendations that may be altered)	3
PHYS 323	Classical Mechanics (Course recommendations that may be altered)	3
Sophia courses (6cr)		
	Credits	**10**
Third Year		
First Semester		
MATH 346	Statistics (Course recommendations that may be altered)	3
PHYS 282L	Modern Experimental Laboratory (Course recommendations that may be altered)	1
PHYS 444	Electricity and Magnetism (Course recommendations that may be altered)	3
Sophia course (3cr)		
Elective courses (6cr)		
	Credits	**7**

Second Semester

MATH 336 or CPSC 315 or CPSC 328	Numerical Analysis (MATH or CPSC 3xx elective. Course recommendations that may be altered) or Simulation: Theory and Application or Data Structures	3
PHYS 323	Classical Mechanics (PHYS elective. Course recommendations that may be altered)	3
Sophia course (3cr)		
Elective courses (7cr)		
	Credits	**6**

Fourth Year

First Semester

Sophia course (3cr)		
Elective courses (13cr)		
	Credits	**0**

Second Semester

MATH 496	Pro-Seminar (Course recommendations that may be altered)	2
Elective courses (14cr)		
	Credits	**2**
	Total Credits	**54**

Statistical & Actuarial Mathematics (SAM) – EVEN Year Start

Course	Title	Credits
First Year		
First Semester		
MATH 131	Calculus I (Sophia Mathematical Arts)	4
SPLL 101 (1cr)		
Sophia Language I (4cr)		
CTS or W (3cr/4cr)		
Sophia course (3cr)		
	Credits	**4**
Second Semester		
CPSC 207	Computer Programming (Sophia Professional Arts. Course recommendations that may be altered)	3
MATH 132	Calculus II	4
Sophia Language II (4cr)		
CTS or W (3cr/4cr)		
Sophia course (3cr)		
	Credits	**7**
Second Year		
First Semester		
MATH 225	Foundations of Higher Mathematics (Course recommendations that may be altered)	3
MATH 231	Calculus III	4
Sophia courses (6cr)		
Elective course (3cr)		
	Credits	**7**

Second Semester

MATH 326	Linear Algebra and Differential Equations	4
MATH 345	Probability	3
Sophia courses (6cr)		
Elective course (3cr)		
	Credits	**7**

Third Year

First Semester

MATH 346	Statistics	3
MATH 353	Abstract Algebra I (Course recommendations that may be altered)	3
Sophia course (4cr)		
Elective courses (6cr)		
	Credits	**6**

Second Semester

MATH 354	Abstract Algebra II (Course recommendations that may be altered)	3
MATH 372	Stochastic Models	3
Sophia course (3cr)		
Elective courses (6cr)		
	Credits	**6**

Fourth Year

First Semester

MATH 335 or MATH 341 or MATH 361	Differential Equations II (MATH 3xx elective. Course recommendations that may be altered) or Analysis I or Geometry	3
MATH 496	Pro-Seminar (Course recommendations that may be altered)	2
Sophia course (3cr)		
Elective courses (8cr)		
	Credits	**5**

Second Semester

MATH 252	Financial Mathematics (Course recommendations that may be altered)	3
Elective courses (16cr)		
	Credits	**3**
	Total Credits	**45**

Statistical & Actuarial Mathematics (SAM) – ODD Year Start

Course	Title	Credits
First Year		
First Semester		
MATH 131	Calculus I (Sophia Mathematical Arts)	4
SPLL 101 (1cr)		
Sophia Language I (4cr)		
CTS or W (3cr/4cr)		
Sophia course (3cr)		
	Credits	**4**

Second Semester

CPSC 207	Computer Programming (Sophia Professional Arts. Course recommendations that may be altered)	3
MATH 132	Calculus II	4
Sophia Language II (4cr)		
CTS or W (3cr/4cr)		
Sophia course (3cr)		
	Credits	**7**

Second Year

First Semester

MATH 225	Foundations of Higher Mathematics (Course recommendations that may be altered)	3
MATH 231	Calculus III	4
Sophia courses (6cr)		
Elective course (3cr)		
	Credits	**7**

Second Semester

MATH 326	Linear Algebra and Differential Equations	4
MATH 345	Probability (Course recommendations that may be altered)	3
Sophia courses (6cr)		
Elective course (3cr)		
	Credits	**7**

Third Year

First Semester

MATH 341	Analysis I (Course recommendations that may be altered)	3
MATH 346	Statistics (Course recommendations that may be altered)	3
Sophia course (4cr)		
Elective courses (6cr)		
	Credits	**6**

Second Semester

MATH 252	Financial Mathematics	3
MATH 342	Analysis II (Course recommendations that may be altered)	3
Sophia course (3cr)		
Elective courses (6cr)		
	Credits	**6**

Fourth Year

First Semester

MATH 335 or MATH 353 or MATH 381	Differential Equations II (MATH 3xx elective. Course recommendations that may be altered) or Abstract Algebra I or Mathematical Modeling	3
MATH 496	Pro-Seminar (Course recommendations that may be altered)	2
Sophia course (3cr)		
Elective courses (8cr)		
	Credits	**5**

Second Semester

MATH 372	Stochastic Models	3
Elective courses (16cr)		
	Credits	**3**
	Total Credits	**45**