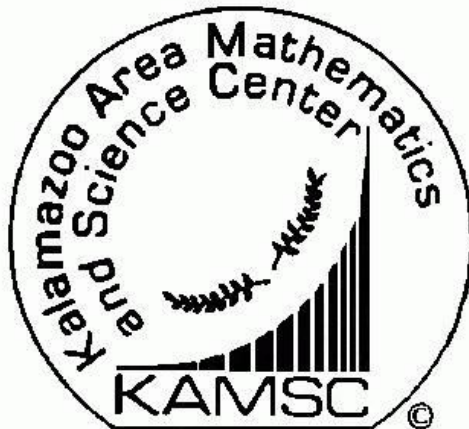


Kalamazoo Area Mathematics and Science Center

Description of Courses

**for
2020-2021**



2020-2021 KAMSC COURSE OFFERINGS

Course Title	9 th /10 th	11 th /12 th	Sem/Year	Period(s)	Credit
Math Courses (Students must choose AT LEAST ONE each year.)					
KAMSC Integ. Math I/Geometry	X		Y	1,2,3	1.0
KAMSC Integ. Math II/Alg. II	X		Y	1,2,3	1.0
KAMSC Integ. Math III/Precal	X	X	Y	2,4,5	1.0
KAMSC AP Calculus AB	X	X	Y	3,5,6	1.0
KAMSC AP Calculus BC		X	Y	4	1.0
KAMSC Advanced Calculus	X	X	Y	1,5	1.0
KAMSC AP Statistics		X	Y	4,6	1.0
KAMSC Discrete Mathematics		X	1 st	5	0.5
Laboratory Science Courses (Students must choose AT LEAST ONE each year.)					
KAMSC Biology	Gr. 9 Required		Y	1,2,3	1.0
KAMSC Chemistry	Gr. 10 Required		Y	1,2,3	1.0
KAMSC Physics	Gr. 11 Required		Y	4,5,6	1.0
KAMSC AP Biology		X	Y	4,6	1.0
KAMSC AP Chemistry		X	Y	5	1.0
KAMSC AP Environ. Science		X	Y	5	1.0
KAMSC Organic Chemistry		X	1 st	6	0.5
KAMSC Bio-Chemistry		X	2 nd	6	0.5
KAMSC Bio-Medical Science		X	Y	4	1.0
* KAMSC AP Physics C	Gr. 12 Only		Y	6	1.0
KAMSC Geology	Gr. 12 Only		1 st	7	0.5
KAMSC Astronomy	Gr. 12 Only		2 nd	7	0.5
** KAMSC Human Genetics	Gr. 12 Only		1 st	7	0.5
** KAMSC Micro-Biology	Gr. 12 Only		1 st	7	0.5
Computer & Technology Courses					
KAMSC Information Technology	Gr. 9 Required		Y	1,2,3	1.0
KAMSC Computer Studies	Gr. 10 Required		Y	1,2,3	1.0
* KAMSC AP Computer Science A		X	Y	6	1.0
* KAMSC Adv. Computer Science		X	2 nd	5	0.5
Enrichment Courses (CR/NC only)					
KAMSC Evol. of Sci. Thought 1	X		1 st	0	0.5
KAMSC Current Topics in Science	X		2 nd	0	0.5
KAMSC Evol. of Sci. Thought 2		X	1 st	7	0.5
KAMSC Bio-Ethics		X	2 nd	7	0.5
KAMSC Indep. Research (Team)		X	Y	Indep.	0.5
* These courses may fulfill the Math requirement after completion of Calculus.					
** These courses are offered in alternating years. (See course description.)					

NOTE: All students are required to enroll in at least one section each of Math and Laboratory Science each semester, plus additional electives to make three (3) full credits. For most classes, seating priority will be given to Seniors, then available seats will be filled with interested Juniors.

MATHEMATICS COURSES (Initial placement depends on middle school math experience):

KAMSC Integ. Math I/Geometry

Instructor: L. Kalnins

Description: Integrated Mathematics-I consists of a unified (integrated) mathematics curriculum. The course will integrate geometry, algebra, probability, statistics, calculators, and problem solving. Students will have completed a first year algebra course before entering the center. Therefore, the major component of the course is geometry. Emphasis is placed on methods of problem solving, problem formulation and applications utilizing graphing calculators.

KAMSC Integ. Math II/Alg. II

Instructor: M. Milka

Description: Integrated Mathematics II consists of a unified (integrated) mathematics curriculum. The course will integrate geometry, algebra, probability, statistics, graphing calculators and problem solving. The major component of this course is advanced algebra, with attention given to the properties and applications of the linear, quadratic, power, exponential, and logarithmic function families. Exploration in probability and statistics will include concepts related to random events and probability distributions. Emphasis is placed on the methods of problem solving and applications utilizing graphing calculators.

KAMSC Integ. Math III/Precal

Instructors: M. Alshehri (AM) & M. Cardwell (PM)

Description: Integrated Mathematics III continues the unified approach to math, concentrating on relating algebraic expressions, graphical representations, verbal/written representations and the associated data found in the real world. This course aims to prepare the student for Calculus by pursuing two main threads: trigonometry and functions. Topics studied include properties of elementary functions, transformations of functions, periodic functions, trigonometric functions, properties of combined sinusoids, triangle trigonometry, logarithms and exponential functions, three dimensional vectors, analytic geometry of conic sections, quadric surfaces, polar coordinates, complex numbers, and the principle of mathematical induction. An exploratory introduction to discontinuity and the definition of limits is also included.

KAMSC AP Calculus AB

Instructor: M. Sinclair (AM) & M. Milka (PM)

Description: Topics will include those listed in the Advanced Placement Calculus AB syllabus, plus an introduction to some topics from Calculus BC. The concepts will be presented using graphical, numerical, and symbolic representations. This two-semester course covers more than one semester of college calculus. Students will learn a variety of methods for determining derivatives and integrals of a function, as well as their applications.

2020-2021 KAMSC COURSE OFFERINGS

KAMSC AP Calculus BC

Instructors: M. Alshehri

Description: Topics will include those suggested in the Advanced Placement Calculus BC syllabus. The concepts will be presented using graphical, numerical, and symbolic representations. This two-semester course covers more than two full semesters of college calculus.

KAMSC Advanced Calculus

Instructor: M. Alshehri

Description: Advanced Calculus covers a variety of topics from areas of applied mathematics that are fundamental to understanding the theoretical foundations of the physical sciences and engineering. Topics include infinite series, complex variables, matrices, partial differentiation, **multi variable calculus**, vector analysis, and Fourier series, and Fourier transforms. Prerequisite: Successful completion of AP Calculus AB OR AP Calculus BC.

KAMSC AP Statistics

Instructor: L. Kalnins

Description: AP Statistics acquaints students with the major concepts and tools for collecting, analyzing, and drawing conclusions from data. Students will frequently work on labs or projects involving the hands-on gathering and analysis of real-world data. Ideas and computations presented in this course have immediate connections and applications to actual events. Computers and calculators will allow students to focus deeply on the concepts involved in statistics. The four main themes of the course are: exploring data, planning a study, anticipating patterns, and statistical inference. This course prepares students for the Advanced Placement examination in Statistics.

KAMSC Discrete Mathematics

{Sem. 1}

Instructor: S. Houtrouw

Description: Discrete Mathematics deals with finite processes, sets of elements, countable phenomena (based on integers—contrasted with calculus, which has to do with infinite processes and intervals of real numbers). While this is NOT a computer class, the mathematical topics and algorithms studied have many applications in the broad field of computer science. Topics include combinatorial analysis (combinations, permutations, counting techniques, etc.), graph theory, mathematical trees, logic gates, circuits, and more.

Note: *Discrete Math may be combined with Advanced CS (Sem. 2) as a math elective following the completion of AP Calculus.*

2020-2021 KAMSC COURSE OFFERINGS

COMPUTER & TECHNOLOGY COURSES:

KAMSC Information Technology

Instructor: M. Cardwell

Description: This is a survey course designed to integrated selected components of math, science, and information technology. Students utilize diverse technologies to explore, develop, analyze and produce appropriate products. Activities focus on software utilization; computers as scientific tools; data analysis; research preparation and presentation; media technologies; introductory computer science and computer programming concepts; and application analysis, selection and mastery. Students are encouraged to master skills associated with exploring and mastering new technologies and new applications.

KAMSC Computer Studies

Instructor: S. Houtrouw

Description: An introduction to computer science with emphasis on the development of problem solving and critical thinking skills. The course begins with computer literacy fundamentals, including computer hardware, system software, binary coding schemes, and an understanding of the developments that made possible the modern computer. Students will learn software development techniques while using the programming control structures of C++. A major focus of the course is on computer-math topics such as computer number systems (binary, octal, hexadecimal), Boolean algebra, digital electronics, graph theory, elementary data structures, recursion, bit-string flicking, Polish/reverse Polish notation, algorithm analysis, and problem solving exposure to other languages including BASIC, LISP and Assembly Language. The course ends with a web design project using HTML, JavaScript and other related tools.

KAMSC AP Computer Science A

Instructor: S. Houtrouw

Description: APCS-A is a two-semester Advanced Placement course for problem solving using the popular Java programming language. The object-oriented programming methodology is used to produce quality computer-based solutions to real problems. Students will develop individual problems solving skills and will learn to solve problems in small groups. Prepares students for the AP Computer Science-A Exam. Intended for any student who wants to learn to combine technological knowledge with analytical and problem-solving skill, regardless of career path.

Note: APCS-A may count as a math elective following the completion of AP Calculus.

KAMSC Adv. Computer Science

{Sem. 2}

Instructor: S. Houtrouw

Description: A one-semester course that follows the APCS-A class and includes the topics once covered in the APCS-AB curriculum (data structures, lists, stacks, queues, trees, and advanced algorithms). Computer-math topics and other object-oriented programming design concepts are also continued and implemented using the Python programming language. Needs to be taken *after* the APCS-A course. Seniors may opt to take it concurrently with APCS-A.

Note: Advanced CS may be combined with Discrete Math (Sem. 1) as a math elective following the completion of AP Calculus AB or BC.

2020-2021 KAMSC COURSE OFFERINGS

LABORATORY SCIENCE COURSES:

KAMSC Honors Biology

Instructor: C. Chapoton

Description: KAMSC Biology is a rigorous college-preparatory survey course. Conceptual themes are integrated with meaningful field and laboratory experiences to develop the student's ability to recognize and solve scientific problems. Major areas of study include: ecology, cell biology, biochemistry, genetics, embryology and diversity of organisms.

KAMSC Honors Chemistry

Instructor: C. Hampton

Description: Introductory course featuring laboratory and inquiry based instruction. The course includes study of the following topics: chemical bonding, thermodynamics, description of compounds through writing and nomenclature, chemical reactions, stoichiometry, the behavior of gases, liquids and solids, light and electron behavior, acids and bases, electrochemistry and organic chemistry. Each student is involved in a team-based research project.

KAMSC Honors Physics

Instructor: M. Sinclair

Description: Physics is an extensive study of the physical laws of nature. Students will be actively involved in the learning and application of basic concepts from classical mechanics, oscillatory and wave motion, light, electromagnetism, special and general relativity, and quantum mechanics. The primary focus of the course is on problem solving and there are a large variety of laboratory activities (including an experiment using Western Michigan University's Tandem Van de Graaff accelerator) as well as an overview of the cutting edge of research in physics. The course is mathematically rigorous and is equivalent to a yearlong introductory college-level physics course. **This is an honors-level course and, with additional extra-curricular preparation, can prepare students for the AP Physics 1 & 2 examinations.** All students are also required to complete an individual semester-long research project in physics, engineering, or mathematics.

KAMSC AP Biology

Instructor: C. Chapoton

Description: AP Biology is a full year course covering the topics in the required Advanced Placement Curriculum but at a deeper level and with a more intense experimental approach. The major goals of AP Biology are to help students develop a conceptual framework for modern biology and to help students gain an appreciation of science as a process. The ongoing information explosion in biology makes these goals even more challenging. Primary emphasis in this course will be on developing an understanding of concepts rather than on memorizing terms and technical details. Essential to this conceptual understanding are the following: a grasp of science as a process rather than as an accumulation of facts; personal experience in scientific inquiry; recognition of unifying themes that integrate the major topics of biology; application of biological knowledge and critical thinking to environmental and social concerns. Course activities include individual research projects, and laboratory investigations in the following areas: Diffusion and Osmosis, Colony Transformation, Enzyme Catalysis, Genetics of Drosophila, Mitosis and Meiosis, Population Genetics and Evolution, Plant Pigments, Transpiration, Cell Respiration, Physiology of the Circulation System, Behavior: Habitat Selection, Dissolved Oxygen and Primary, Productivity.

2020-2021 KAMSC COURSE OFFERINGS

KAMSC AP Chemistry

Instructor: C. Hampton

Description: AP Chemistry is an advanced level chemistry course equivalent to an honors freshman college chemistry course and will offer excellent preparation for the Advanced Placement Exam in Chemistry. Emphasis will be placed upon chemistry as an experimental and quantitative science. The second semester will involve the use of the analytical instruments in the KAMSC Project Lab such as Infrared Spectrophotometer, UV-Visible Spectrophotometer, Gas Chromatography, HPLC, and Polarimeter. Projects will be performed in small groups on each instrument. For the AP test to be a viable option, both semesters should be elected.

KAMSC AP Physics C

Instructor: M. Alshehri

Description: AP Physics will cover some of the topics in the required 11th grade introductory physics course, but at a deeper and more thorough mathematical level involving calculus and vector calculus appropriately as the course progresses. It covers topics in Physics C: Mechanics, as well as Physics C: Electricity and Magnetism. Additional topics include rotational motion, angular momentum, fluid dynamics, statistical mechanics, AC circuits, and physical optics. Relativity and quantum mechanics will also be treated. Course activities will include quantitative research projects, and opportunities to employ physics principals to design, construct, predict, and maximize the performance of devices. Course projects will introduce students to calculator based and/or computer based data acquisition and analysis techniques.

NOTE: AP Physics may be counted as either a Math or Science course, following AP Calculus.

KAMSC Organic Chemistry

{Sem. 1}

Instructor: C. Hach

Description: Organic Chemistry is the chemistry of carbon compounds. Students will study common classes of compounds, stressing structure, nomenclature and general reaction types. Extensive laboratory experiences will be an integral portion of the course.

KAMSC Bio-Chemistry

{Sem. 2}

Instructor: C. Hach

Description: Bio-Chemistry examines the chemistry of living things and the inter-relationships of various metabolic pathways. Extensive laboratory activity will provide hands-on experience with various clinical methods including electrophoresis, chromatography and spectrophotometry. This course is designed for motivated students of biology and chemistry who wish to round out their experiences in both sciences. Prerequisite: Organic Chemistry or instructor permission.

2020-2021 KAMSC COURSE OFFERINGS

KAMSC Bio-Medical Science

Instructor: C. Hach

Description: Biomedical Science is a course designed for students interested in life sciences. This course is devoted to the structure and function of organ-systems and how they work together to maintain a dynamic equilibrium called homeostasis. The class is richly infused with laboratory investigation. Lecture, lab, field experiences and guest presenters will be utilized to study anatomy, physiology and human genetics.

KAMSC AP Environmental Science

Instructor: C. Hach

Description: AP Environmental Science is a capstone, interdisciplinary science course. The course allows students a look at more advanced studies in environmental science including the biospheric, lithospheric, hydrospheric and atmospheric forces contributing to global changes. The impact of humans as a significant force in shaping an altered environment will also be investigated. Lecture, guest lectures, labs, field and experiences will be utilized to develop an understanding of the earth on a global scale describing how component parts have evolved, how they function and how they are expected to continue. Course content exceeds the AP syllabus.

KAMSC Human Genetics ** {7th Period, Sem. 1, 2020-21}

Instructor: C. Hach

Description: Human Genetics will cover three major areas: **Classical Genetics** consists of the techniques and methodologies of genetics that predate the advent of molecular biology, and includes a study of the cell theory, cell structure, mitosis, meiosis, patterns of inheritance, and how mitosis and meiosis are involved in the disease process. **Molecular Genetics** primarily studies the interactions between DNA, RNA and protein biosynthesis and how these interactions are regulated including a study of human chromosomes, population genetics, and human diseases.

Bioinformatics derives knowledge from computer analysis of biological data. These can consist of the information stored in the genetic code, but also experimental results from various sources, such as, patient statistics, and scientific literature. Students will learn the basics of bioinformatics by learning to use large scientific databases to search for gene sequences, diseases and phylogenic comparisons. It has many practical applications in different areas of biology, medicine, agriculture, conservation, and evolution.

Note: This class will meet on Monday and Friday from 2:00 to 2:45, with a lab component every Tuesday from 2:00 to 3:30 PM. Students who might have a conflict with extra-curricular activities should NOT select this course. This class is open to Juniors, but only in addition to 3 other credits.

KAMSC Micro-Biology ** {7th Period, Sem. 1, 2021-22}

Instructor: C. Hach

Description: Microbiology is designed to introduce students to the various roles micro-organisms play as they relate to human activities. Laboratory work includes microbial techniques in cultivating, staining, and enumeration of microorganisms from soil, water, food, and humans. Lecture, extensive labs, guest lectures, and field trips will be utilized to discuss metabolism, genetics and disease potential of these organisms as they impact humans.

2020-2021 KAMSC COURSE OFFERINGS

KAMSC Geology **

{7th Period, Sem. 1}

Instructor: M. Sinclair

Description: Geology is a qualitative overview of mineralogy and petrology, hydro-geologic processes, landform development, geologic time, and plate tectonics. The course has an extensive laboratory component and a number of field investigations.

KAMSC Astronomy **

{7th Period, Sem. 2}

Instructor: M. Sinclair

Description: Astronomy is a mathematically rigorous but generally descriptive one-semester course covering introductory astronomy, astrophysics, and planetary science. The focus of the course is on observational astronomy and there are an extensive number of field exercises throughout the term. Students will have access to high-quality telescopes for much of the course, and some off-site observational work will be conducted at the Kalamazoo Nature Center.

**** NOTE:** *Due to their popularity, a lottery MAY be held to determine enrollment for Geology and Astronomy. Students are NOT guaranteed a space in either class, but an attempt will be made to allow enrollment in one or the other, according to each student's first preference. This may require that an additional science course be selected to maintain a full schedule for both semesters.*

2020-2021 KAMSC COURSE OFFERINGS

ENRICHMENT COURSES: *These courses are intended to enhance the student's program of mathematics and science study. As such, they may NOT be counted as part of a student's 3 required credits.*

KAMSC Evol. of Scientific Thought 1

{0 Period, Sem. 1}

Instructor: C. Hach

Description: KAMSC Evolution of Scientific Thought is designed to explore the science process through the evolution of great scientific discoveries. Such discoveries may include not only significant events in mathematics, chemistry, biology and physics, but also the progression of scientific thought that made these events possible. Our study will include an exploration of the role of a prepared mind and the scientific discovery process. Reading and discussion will be used to examine how our understanding of empirical phenomena have changed over time and the ways that technology, as it promotes scientific discovery, have impacted thinking about science.

NOTE: This course is offered on a CR/NC basis. Class meets each Wednesday at 7 AM.

KAMSC Evol. of Scientific Thought 2

{7th Period, Sem. 1}

Instructor: C. Hach

Description: Evolution of Scientific Thought is designed to explore the science process through the evolution of great scientific discoveries. Such discoveries may include great events in mathematics, chemistry, biology, physics and astronomy and the sequence of scientific thought that made them possible. The examination includes and exploration of the role of a prepared mind and the scientific discovery process. Readings, discussions and books will be used to examine events, thoughts and people include: Gravity, The Periodic Table of Elements, Atomic Theory, Quantum Mechanics, Evolution, DNA, Biotechnology, Probability Theory, Organic Synthesis, Medical Breakthroughs, Emerging Infectious Diseases and many other topics. The course is unique in that it will rely on the Internet to communicate with each other.

**NOTE: This course is offered on a CR/NC basis. Class meets every Wednesday at 2 PM.*

KAMSC Current Topics in Science

{7th Period, Sem. 2}

Instructor: C. Hach

Description: This elective is a discussion course, eligible for any KAMSC tenth grade student, as a zero hour offering. Students will read and discuss topics that relate to science, mathematics and technology. It is the intention of this course to encourage these interests and elevate student knowledge of current events in science from a superficial, "sound-byte" understanding to one that is deep and able to be transferred to future learning.

NOTE: This course is offered on a CR/NC basis. Class meets each Wednesday at 7 AM.

2020-2021 KAMSC COURSE OFFERINGS

KAMSC Bio-Ethics

{7th Period, Sem. 2}

Instructor: C. Hach

Description: Bio-Ethics is designed to promote dialogue on the social and ethical implications of science and technology. Dialogue will examine such questions as: What are effects of science and technology on society and individuals? How can science and technology be managed? What is the role the individual in examining these decisions? Use of animals in research, informed consent for drug experimentation, “Can genes be patented?”, the impact of the Human Genome Project, physician-assisted dying, designing offspring, Fetal Alcohol Syndrome, DNA databases for criminals, breast cancer susceptibility, Alzheimer’s Disease and many more topics will be discussed. **The course is unique in that it will rely on the Internet** to research topics and communicate with each other. Students who have access to appropriate technology will learn concepts in ethics to solve global problems through responsible use of science and technology.

NOTE: This course is offered on a CR/NC basis. Meets every Wednesday at 2 PM.

KAMSC Indep. Research (Research Team)

Research Coordinator: J. Richardson

Description: This a one semester credit course that lasts the entire school year. As an independent research course, students are placed with research mentors in the community or at KAMSC. In collaboration with a mentor, they will develop a research project proposal and carry out the research during the school year. The research takes place after KAMSC’s school day and often several times a week. Milestones of accomplishments will be set by the Research Coordinator. Students are expected to participate in monthly meetings, science seminars, and science fair competitions.

NOTE: This course is offered on a CR/NC basis. Assignment to the Research Team is by application only – details are available from the Research Coordinator. The application process must be completed before students will be assigned to this course.

Also NOTE: Research Team may NOT count as part of a Junior’s 3 required credits, but it may count as ½ credit towards a Senior’s 3 required credits.

KAMSC PM Course Layout - 2020-21

Teacher	4th Period		5th Period		6th Period		7th Period		
	Sem 1	Sem 2	Sem 1	Sem 2	Sem 1	Sem 2	Sem 1	Sem 2	
Sinclair	Physics		Physics		Physics		Geology	Astronomy	
Cardwell	Math 3		Math 3						
Milka			AP Calculus AB		AP Calculus AB				
Kalnins	AP Statistics				AP Statistics				
Houtrouw			Discrete Math	Adv. CS	AP Computer Science				
Alshehri	AP Calculus BC		Adv. Calculus		AP Physics C		Differential Equations (post-Adv. Calc. ONLY)		
Hampton			AP Chemistry						
Chapoton	AP Biology				AP Biology				
Hach	Bio-Medical Science		AP Environ. Science		Organic Chemistry	Bio-Chemistry	Genetics		
Richardson	Research Team	← Can be selected during any period of the day.						Evol. Sci. 2	Bio-Ethics

Math Courses

Juniors Only

Seniors Only

These do not count towards required 3 credits.