

DEPARTMENT OF CHEMISTRY, MATHEMATICS & PHYSICS

Overview

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The Department of Chemistry, Mathematics & Physics offers programs of study which prepare students for careers in the natural sciences. All students have a core of knowledge essential to the scientific experimentation that influences our daily lives. From atomic theories to basic chemical structures, the prospective chemist studies the material necessary for work in engineering, pharmacy, medicine, medical technology, dentistry, and research in chemistry. In addition, the department is a major contributor to general studies and provides students with the skills needed in careers such as business, government, industry technology, and educational institutions. Students in all programs are encouraged to get involved in research with faculty and often have the opportunity to present their findings at regional, national, and international conferences.

Chemistry

Chemistry students can choose between a general chemistry degree, or an American Chemical Society (ACS) approved degree. Both programs' curriculum provides excellent preparation in organic chemistry, quantitative chemistry, biochemistry, and physical chemistry core courses taken by all students. The general chemistry degree provides great flexibility with electives for students who desire to enter a chemical related field including chemical business, chemical forensics, chemical education, chemical biology, health sciences, and others. The ACS approved program is the most comprehensive program available. This program is especially helpful to those working towards an advanced degree in chemistry, or planning a career in research, laboratory, and industrial careers.

Biochemistry and Molecular Biology

Biochemistry and molecular biology (BMB) is a joint program with the Department of Biology and includes a core curriculum comprised of both chemistry and biology courses. Students can opt for a general BMB degree, or an ACS approved degree. Like the chemistry degree, the general degree offers more flexibility with electives to tailor the degree, while the ACS degree is great for those wanting a BMB specific career. Both programs provide an excellent foundation for further study in graduate programs and professional programs such as medicine, dentistry, pharmacy, or veterinary sciences.

Medical Laboratory Science

The Medical Laboratory Science program (MLS), also referred to as Clinical Laboratory Science, prepares students for a career in the medical laboratory performing diagnostic services to detect and treat disease. The first three years of the MLS program provides students with the essential background knowledge in chemistry and biology required for students to be successful in the clinical coursework. The fourth year is spent in an affiliated hospital which provides the structured educational program in a clinical laboratory. The clinical training programs are accredited by the Committee on Allied Health Education and Accreditation of the American Medical Association through the

National Accrediting Agency for Clinical Laboratory Sciences (NAACLS). Upon completion of the clinical program, students are eligible to take a national credentialing examination to become a certified Medical Laboratory Scientist.

Majors

- Biochemistry and Molecular Biology (Bachelor of Science, B.S.) (<https://catalog.missouriwestern.edu/undergraduate/science-and-health/chemistry-mathematics-physics/biochemistry-molecular-biology-bs/>)
- Chemistry (Bachelor of Science, B.S.) (<https://catalog.missouriwestern.edu/undergraduate/science-and-health/chemistry-mathematics-physics/chemistry-bs/>)
- Medical Laboratory Science (Bachelor of Science, B.S.) (<https://catalog.missouriwestern.edu/undergraduate/science-and-health/chemistry-mathematics-physics/medical-laboratory-science-bs/>)

Certificate

- Laboratory Technician Pre-Apprenticeship (Certificate (<https://catalog.missouriwestern.edu/undergraduate/science-and-health/chemistry-mathematics-physics/laboratory-technician-pre-apprenticeship-certificate/>))

Minors

- Applied Mathematics Minor (<https://catalog.missouriwestern.edu/undergraduate/science-and-health/chemistry-mathematics-physics/applied-mathematics-minor/>)
- Chemistry Minor (<https://catalog.missouriwestern.edu/undergraduate/science-and-health/chemistry-mathematics-physics/chemistry-minor/>)
- Cognitive Science Minor (<https://catalog.missouriwestern.edu/undergraduate/interdisciplinary-studies/cognitive-science-minor/>)
- Data Science Minor (<https://catalog.missouriwestern.edu/undergraduate/science-and-health/chemistry-mathematics-physics/data-science-minor/>)
- Entrepreneurship Minor (<https://catalog.missouriwestern.edu/undergraduate/interdisciplinary-studies/entrepreneurship-minor/>)

Courses

Chemistry (CHE)

CHE 100 Chemistry Essentials Credits: 3

Typically Offered: Fall, Spring.

Course Description: Lecture only for non-science majors. A survey of chemical concepts and applications that emphasizes consumer and societal issues. Three hours lecture.

CHE 101 Introductory Chemistry Credits: 4

Typically Offered: Fall, Spring.

Course Description: Chemistry for liberal arts and sciences students; meets the minimum physical science requirement. Three hours lecture, two hours lab.

CORE 42: MOTR CHEM 100L; Essentials in Chemistry with Lab (attributes MO33, MLAB)



CHE 111 General Chemistry I Credits: 5**Typically Offered:** Fall, Spring.**Course Description:** Basic concepts of chemistry: atomic theory and periodic system, chemical calculations, oxidation-reduction, states of matter, theory of chemical bonding, atomic structures. Four hours lecture, three hours lab. **Prerequisite(s):** ACT Math subscore of at least 22 or a grade of C or higher in MAT 110E or score of 70 or higher on the MWSU Math Placement Exam, or the equivalent.**CORE 42:** MOTR CHEM 150L; Chemistry with Lab (attributes MO33, MLAB)**CHE 112 Problem Solving for General Chemistry I Credits: 1****Typically Offered:** Fall, Spring.**Course Description:** Elective course to accompany CHE 111 General Chemistry I. Focused instruction on problem solving strategies and tools associated with course content of General Chemistry I. Topics include symbolic chemical language, mathematics of General Chemistry, unit conversions and unit analysis, essential graphing, word problem strategies, employing technology to solve problems, and critical analysis of results. This course must be taken concurrently with CHE 111. Graded on a pass/fail basis.**CHE 120 General Chemistry II with Qualitative Analysis Credits: 5****Typically Offered:** Fall, Spring.**Course Description:** Continuation of CHE 111. Thermochemistry, equilibrium, electrochemistry, radiochemistry, coordination chemistry, and a survey of the main group elements and their compounds. Laboratory includes the topics above along with the separation and identification of some of the more common anions and cations by qualitative analysis. Four hours lecture, three hours laboratory. **Prerequisite(s):** A grade of C or higher in CHE 111 and a grade of C or higher in MAT 116, or a Math score ACT of 25 or higher, or the equivalent.**CHE 121 Problem Solving for General Chemistry II Credits: 1****Typically Offered:** Fall, Spring.**Course Description:** Elective course to accompany CHE 120 General Chemistry II. Focused instruction on problem solving strategies and tools associated with course content of General Chemistry II. Topics include mathematics of General Chemistry II including applications of algebra for solving problems in kinetics, thermodynamics and chemical equilibria, and solving complex word problems. This course must be taken concurrently with CHE 120. Graded on a pass/fail basis.**CHE 150 Basic Laboratory Skills Credits: 3****Typically Offered:** Summer.**Course Description:** An immersive laboratory experience in which students learn basic chemical laboratory skills that will prepare them for a laboratory apprenticeship experience. Skills include laboratory safety, chemical and waste management, use of a balance, use of calibrated glassware and equipment, preparation of solutions, use of basic laboratory instrumentation, and titration. One hour lecture, six hours lab per week. **Prerequisite(s):** A grade of C or higher in BIO 101, BIO 105, or BIO 106, a grade of C or higher in CHE 111, and a grade of C or higher in MAT 116.**CHE 283 Introduction to Research Methods in Chemistry Credits: 1-3****Typically Offered:** Departmental Discretion.**Course Description:** Introduction to basic research in chemistry. Individual and team projects involving methods for solving chemistry-related research problems. May be repeated for credit. **Prerequisite(s):** High school chemistry, freshman or sophomore standing, and departmental approval.**CHE 290 Chemical Laboratory Apprenticeship I Credits: 1****Typically Offered:** Fall, Spring, Summer.**Course Description:** Immersive on the job laboratory training experience with a Chemical Laboratory Technician Apprenticeship partner organization. This course may be repeated until a total of 2000 hours of on the job training have been completed. **Prerequisite(s):** Successful completion of the Laboratory Technician Pre-Apprenticeship Microcredential and departmental approval.**CHE 295 Colloquium in Chemistry Credits: 1****Typically Offered:** Departmental Discretion.**Course Description:** An introduction to careers in chemistry and chemistry related fields. Breadth of career paths and educational requirements for those paths will be emphasized. **Prerequisite(s):** Freshman or sophomore standing, or departmental approval.**CHE 308 History and Philosophy of the Natural Sciences Credits: 3****Typically Offered:** Spring.**Course Description:** A study of the history of the natural sciences with an emphasis on the philosophical analysis of these events. Same as BIO 308 and PHL 308. **Prerequisite(s):** Completion of General Studies Mathematics and Natural Sciences requirements.**CHE 310 Organic Chemistry I Credits: 3****Typically Offered:** Fall.**Course Description:** Methods of synthesis of organic compounds, reaction paths, chemical bonding, and geometry of organic molecules; aliphatic and aromatic compounds. Topics include substitution, elimination, and electrophilic addition reactions and mechanisms along with an overview of functional groups. Three hours lecture.**Prerequisite(s):** A grade of C or higher in CHE 120.**CHE 311 Organic Chemistry Laboratory I Credits: 2****Typically Offered:** Fall.**Course Description:** Laboratory course to accompany CHE 310 Organic Chemistry I lecture. One hour lecture and three hours lab. **Prerequisite(s):** Credit or concurrent enrollment in CHE 310.**CHE 312 Organic Chemistry II Credits: 3****Typically Offered:** Spring.**Course Description:** Reactions, mechanisms and methods of synthesis of organic compounds. Topics include oxidation & reduction, conjugated & aromatic systems, aromatic substitution, amines, carboxylic acids and derivatives, carbonyl compounds, polymerization and carbohydrates. Three hours lecture. **Prerequisite(s):** A grade of C or higher in CHE 310 and CHE 311.**CHE 313 Organic Chemistry Laboratory II Credits: 2****Typically Offered:** Spring.**Course Description:** Laboratory course to accompany CHE 312. Six hours lab. **Prerequisite(s):** Credit or concurrent enrollment in CHE 312.**CHE 321 Quantitative Analysis Credits: 4****Typically Offered:** Fall.**Course Description:** Analytical chemistry; gravimetric, volumetric, colorimetric, and electroanalytical determinations. Two hours lecture, six hours lab. **Prerequisite(s):** A grade of C or higher in CHE 120.**CHE 326 Instrumental Analysis Credits: 4****Typically Offered:** Spring.**Course Description:** Theories and methods in modern instrumental analysis. Three hours lecture, three hours lab. **Prerequisite(s):** A grade of C or higher in CHE 310, CHE 311, and CHE 321.

CHE 340 Foundations of Physical Chemistry Credits: 4**Typically Offered:** Fall.**Course Description:** A foundational course in Physical Chemistry covering thermodynamics, chemical equilibrium, properties of solutions, electrochemistry, kinetic theory of gases, and chemical kinetics.**Prerequisite(s):** A grade of C or higher in CHE 310, CHE 311, PHY 110, and MAT 167.**CHE 370 Biochemistry I Credits: 4****Typically Offered:** Fall, Spring.**Course Description:** An introduction to biological compounds their roles within cells and biological systems with an emphasis on structure and function, energy and metabolism, and biological storage of information. Three hours lecture, three hours lab. CHE 312 recommended.**Prerequisite(s):** A grade of C or higher in CHE 310 and CHE 311.**CHE 380 Environmental Chemistry & Chemical Management Credits: 3****Typically Offered:** Spring (odd-numbered years).**Course Description:** Study of environmental chemistry as it affects the operation of chemical facilities in a global society and the application of chemical knowledge to important current problems, including safe chemical storage and waste management. This course will provide background for understanding the demands of the chemical industrial workplace or for advanced study of these topics. **Prerequisite(s):** A grade of C or higher in CHE 310, CHE 311, and CHE 321.**CHE 420 Chemistry Laboratory Assistantship Credits: 1,2****Typically Offered:** Fall, Spring, Summer.**Course Description:** A laboratory assistant experience within a teaching laboratory. This experience may not be substituted for other courses required in the student's major area. Course grades are assigned on a pass/fail basis. May be repeated for credit. **Prerequisite(s):** A grade of C or higher in CHE 111 and department approval.**CHE 426 Instrumental Methods Credits: 5****Typically Offered:** Departmental Discretion.**Course Description:** Modern methods of chemical instrumentation; includes both practical application; and fundamental theories of instrumental analyses. Three hours lecture, six hours lab. **Prerequisite(s):** CHE 321 and CHE 340.**CHE 441 Advanced Inorganic Chemistry Credits: 3****Typically Offered:** Spring (even-numbered years).**Course Description:** Modern concepts of inorganic chemistry, encompassing chemical bonding theories, acid-base theories, mechanisms of inorganic chemistry, symmetry in molecules, inorganic thermodynamics, and atomic and molecular structure. Three hours lecture. **Prerequisite(s):** CHE 310 and CHE 311.**CHE 442 Inorganic Synthesis Credits: 1****Typically Offered:** Departmental Discretion.**Course Description:** Selected synthetic techniques involving inert atmosphere, non-aqueous solvents, vacuum manipulation, and electrolytic oxidation, as currently applied to the purification and characterization of a wide variety of inorganic materials. Three hours lab. **Prerequisite(s):** CHE 310, CHE 311, and credit or concurrent enrollment in CHE 441.**CHE 445 Advanced Topics in Chemistry Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Advanced material in Organic, Inorganic, Physical, Analytical, or Biochemistry, taught on a rotational basis. Specific topics may include, but are not limited to: Applied Spectroscopy, Chemical Kinetics, Macromolecular Chemistry (Polymers), Physical Inorganic Chemistry, Applied Chromatography, Advanced Organic Chemistry, or Advanced Biochemistry. This course may be repeated for credit for multiple topics. **Prerequisite(s):** CHE 312 and CHE 340.**CHE 450 Independent Research/Project Credits: 1-5****Typically Offered:** Fall, Spring, Summer.**Course Description:** Investigation of a research problem, project, or topic on an individual conference basis. May be repeated for credit.**Prerequisite(s):** Minimum of 2.5 GPA in major field, and departmental approval.**CHE 465 Chemistry Teaching: Methods and Techniques Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Modern techniques in teaching high school chemistry: use of multimedia equipment, project approach, lesson planning, accreditation standards at state and national levels, and difficulties in chemistry instruction at the secondary level.**Prerequisite(s):** CHE 310 or departmental approval.**CHE 470 Biochemistry II Credits: 3****Typically Offered:** Spring (even-numbered years).**Course Description:** Continuing study of the biochemical basis of biological systems with a more expansive understanding of biomolecular structure and function, the interaction of biological molecules, energy and intermediary metabolism, biological signaling, and methods used for biochemical study. Three hours lecture. CHE 312 recommended.**Prerequisite(s):** A grade of C or higher in CHE 370.**CHE 475 Internship in Chemistry Credits: 1-3****Typically Offered:** Fall, Spring, Summer.**Course Description:** An extracurricular experience related to a unique approved chemistry career experience or a preprofessional experience. Course grades assigned on a Pass/Fail basis. May be taken for up to 6 credit hours. **Prerequisite(s):** Junior or Senior standing, a declared major in the Department of Chemistry, and departmental approval.**CHE 480 Advanced Physical Chemistry Credits: 4****Typically Offered:** Spring (odd-numbered years).**Course Description:** Second course in physical chemistry covering quantum chemistry, spectroscopy, bonding, and statistical thermodynamics. **Prerequisite(s):** Grade of C or better in CHE 340, PHY 111, and either MAT 177 or MAT 287.**CHE 485 Chemistry Capstone Experience Credits: 2****Typically Offered:** Fall.**Course Description:** A capstone laboratory experience. Covering research methodology, project planning, use of the chemical literature, experimentation, and scientific presentations with a mesoscale, supramolecular, nanoscale (MSN) focus. **Prerequisite(s):** A grade of C or higher in CHE 310, CHE 311, and CHE 321.

CHE 490 Research in Chemistry Credits: 1-3**Typically Offered:** Fall, Spring Summer.**Course Description:** Original research on problems in various fields of chemistry. Hours arranged. May be repeated for credit. Students are expected to work a minimum of 3 hours per week for each credit hour enrolled. A presentation of the work is required at the end of each enrolled term. A summary of the work will be provided to the research advisor (irrespective of credit hours) and written reports of the work must be submitted for research projects involving 2 or more credit hours. May be repeated for credit. **Prerequisite(s):** CHE 310 and CHE 311 or consent of department chairperson.

Mathematics (MAT)

MAT 083 Foundations for University Mathematics Credits: 3**Typically Offered:** Fall, Spring.**Course Description:** The study of fundamental arithmetic and algebraic concepts prerequisite to university level mathematics.**MAT 110 Contemporary Problem Solving Credits: 3****Typically Offered:** Fall, Spring.**Course Description:** Mathematics for solving selected real-world problems using elementary graph theory, data analysis, techniques of decision making, and the mathematics of finance. Course content is equivalent to MAT 110E. **Prerequisite(s):** ACT math subscore of at least 22 or a sufficient score on the math placement exam or departmental approval.**CORE 42:** MOTR MATH 120; Mathematical Reasoning and Modeling (attribute MO41)**MAT 110E Contemporary Problem Solving Credits: 4****Typically Offered:** Fall, Spring.**Course Description:** Mathematics for solving selected real-world problems using elementary graph theory, data analysis, techniques of decision making, and the mathematics of finance. Course content is equivalent to MAT 110. Three hours lecture, two hours lab.**CORE 42:** MOTR MATH 120; Mathematical Reasoning and Modeling (attribute MO41)**MAT 111 Introductory Statistics Credits: 3****Typically Offered:** Fall, Spring.**Course Description:** A general introduction to statistics for students whose academic interests involve the analysis and interpretation of data. Emphasis is placed on the development of statistical thinking and the use of technology. Topics include graphical and numerical methods for summarizing univariate and bivariate data, basic probability, discrete and continuous probability distributions, linear regression, characteristics of good study designs, confidence intervals and hypothesis testing. Course content is equivalent to MAT 111E. **Prerequisite(s):** ACT math subscore of at least 22; a sufficient score on the math placement exam; a minimum grade of C in MAT 110 or MAT 110E or higher; departmental approval.**CORE 42:** MOTR MATH 110; Statistical Reasoning (attribute MO41)**MAT 111E Introductory Statistics Credits: 4****Typically Offered:** Fall, Spring.**Course Description:** A general introduction to statistics for students whose academic interests involve the analysis and interpretation of data. Emphasis is placed on the development of statistical thinking and the use of technology. Topics include graphical and numerical methods for summarizing univariate and bivariate data, basic probability, discrete and continuous probability distributions, linear regression, characteristics of good study designs, confidence intervals and hypothesis testing. Course content is equivalent to MAT 111. Three hours lecture, two hours lab.**CORE 42:** MOTR MATH 110; Statistical Reasoning (attribute MO41)**MAT 112 Finite Mathematics Credits: 3****Typically Offered:** Spring.**Course Description:** Linear and quadratic equations, graphs, and functions including exponential and logarithmic functions; mathematics of finance, annuities, sinking funds and mortgages; linear programming; counting methods, probability, expectation; descriptive statistics. Not open to the student with credit in MAT 167. **Prerequisite(s):** ACT math subscore of at least 22; a sufficient score on the math placement exam; a minimum grade of C in MAT 110 or MAT 110E or higher; departmental approval.**CORE 42:** MOTR MATH 120; Mathematical Reasoning and Modeling (attribute MO41)**MAT 116 College Algebra Credits: 3****Typically Offered:** Fall, Spring.**Course Description:** Linear, quadratic, and miscellaneous equations and inequalities; relations and functions including polynomial, exponential, and logarithmic functions; graphing; systems of equations; and matrices. Not open to the student with credit in MAT 167. **Prerequisite(s):** ACT math subscore of at least 22; a sufficient score on the math placement exam; a minimum grade of C in MAT 110 or MAT 110E or higher; departmental approval.**CORE 42:** MOTR MATH 130; Pre-Calculus Algebra (attribute MO41)**MAT 119 Trigonometry Credits: 2****Typically Offered:** Fall, Spring.**Course Description:** Trigonometric functions, trigonometric identities, trigonometric equations, solution of triangles, inverse trigonometric functions. Not open to the student with credit in MAT 167. **Prerequisite(s):** ACT math subscore of at least 22; a sufficient score on the math placement exam; a minimum grade of C in MAT 110 or MAT 110E or higher; departmental approval.**MAT 147 Applied Calculus Credits: 5****Typically Offered:** Fall.**Course Description:** An applied course in techniques of differentiation and integration; applications primarily from the technological fields; analytic geometry, functions, differential and integral calculus. **Prerequisite(s):** ACT math score of 25 or higher or a grade of C or higher in MAT 116.**CORE 42:** MOTR MATH OTHER; Mathematical Sciences (attribute MO41)

MAT 167 Calculus with Analytic Geometry I Credits: 5**Typically Offered:** Fall.**Course Description:** The first of three sequenced courses in calculus. Includes the study of limits and continuity of real functions, the derivative and its applications, the integral, and the integration and differentiation of trigonometric, exponential and logarithmic functions. **Prerequisite(s):** ACT math score of 25 or higher or a grade of C or higher in MAT 116 and MAT 119.**CORE 42:** MOTR MATH OTHER; Mathematical Sciences (attribute MO41)**MAT 177 Calculus with Analytic Geometry II Credits: 3****Typically Offered:** Spring (odd-numbered years).**Course Description:** The second of three sequenced courses in calculus. Includes the study of applications of integration, integration techniques, improper integrals, differential equations, and infinite sequences and series. **Prerequisite(s):** A grade of C or higher in MAT 147 or MAT 167.**MAT 206 Mathematical Transitions Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** This course is designed to prepare students thoroughly for the transition into university level mathematics. Its main content is the development of formal proof, concise logical reasoning and the ability to write mathematically. Topics include but not limited to proof techniques, induction, number systems, function and sets, complex numbers, series and sequences, matrices. **Prerequisite(s):** Credit or concurrent enrollment in MAT 177.**MAT 211 Applied Statistical Reasoning Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Fundamental principles and techniques of statistical investigations and data analysis. Going beyond the typical introductory statistics course, this course focuses on the methods of analysis of variance and linear regression. Students are introduced to the R programming language for exploring data sets and performing statistical tests. **Prerequisite(s):** Credit or concurrent enrollment in MAT 147 or MAT 167.**MAT 217 Modeling and Simulation Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Fundamental principles and techniques of modeling and simulation. Iterative and recursive algorithms will be used to explore mathematical problem-solving techniques such as factoring and simplifying expressions, solving equations, differentiation and integration, and plotting curves and surfaces. **Prerequisite(s):** Credit or concurrent enrollment in MAT 147 or MAT 167.**MAT 283 Introduction to Research Methods in Mathematics Credits: 1-2****Typically Offered:** Departmental Discretion.**Course Description:** Introduction to basic research methods in Mathematics. Individual and team projects involving methods for solving mathematics-related research problems. May be taken for up to 2 credit hours. **Prerequisite(s):** Departmental approval.**MAT 287 Multivariable Calculus Credits: 3****Typically Offered:** Spring (even-numbered years).**Course Description:** The third of three sequenced courses in calculus. Includes the study of solid analytic geometry, vectors and vector calculus, partial differentiation, and multiple integrals. **Prerequisite(s):** A grade of C or higher in MAT 147 or MAT 167.**MAT 305 Applied Matrix Theory Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** The study of systems of equations, matrices, linear transformations, matrix operations, determinants, matrix inversion, linear systems, eigenvalues and eigenvectors, with an emphasis on concrete computations and applications. **Prerequisite(s):** A grade of C or higher in MAT 217.**MAT 306 Linear Algebra Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Vector spaces, linear transformations, matrix operations, determinants, matrix inversion, linear systems, eigenvalues, canonical forms. **Prerequisite(s):** Credit or concurrent enrollment in MAT 287.**MAT 309 Data Visualization Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** An introduction to the basic principles of effective data visualization. Students gain hands-on experience with tools and techniques used for accessing, exploring, and summarizing large data sets. Students learn to create graphics and data dashboards to effectively convey and communicate their observations and insights. **Prerequisite(s):** A grade of C or higher in MAT 211.**MAT 315 Topics in Geometry Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Synthetic projective geometry; basic symbolic logic; mathematical systems and finite geometries; algebraic geometry; non-Euclidean geometry. **Prerequisite(s):** Credit or concurrent enrollment in MAT 306.**MAT 317 Differential Equations Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Common types of ordinary differential equations; differential operators, Laplace transforms; systems of differential equations; partial differential equations; Fourier series; applications. **Prerequisite(s):** A grade of C or higher in both MAT 287 and MAT 305.**MAT 332 Probability Theory Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** The study of discrete and continuous probability distributions. **Prerequisite(s):** A grade of C or higher in MAT 177 or MAT 287.**MAT 352 Mathematics for Elementary and Middle School Teachers I Credits: 3****Typically Offered:** Fall.**Course Description:** The development of a teacher's understanding of elementary school mathematics, including the study of whole number arithmetic, mental mathematics, pre-algebra, problem solving, number theory, and operations on fractions, integers, decimals, and irrational numbers. Not applicable to the major or minor in mathematics. **Prerequisite(s):** A grade of C or higher in MAT 112 or MAT 116.**MAT 353 Mathematics for Elementary and Middle School Teachers II Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Introductory geometry; geometric constructions; measurement geometry; motion geometry; introductory probability and statistics. Not applicable to the major or minor in mathematics. **Prerequisite(s):** A grade of C or higher in MAT 352.

MAT 401 Advanced Modeling Credits: 3**Typically Offered:** Departmental Discretion.**Course Description:** A study of the modeling process including creative and empirical model construction, model analysis, and model research.**Prerequisite(s):** A grade of C or higher in MAT 317.**MAT 409 Statistical Learning Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** This course will provide a broad introduction to machine learning and cover the fundamental algorithms for supervised and unsupervised learning, with a focus on regression and classification methods. Emphasis will be on statistical learning methodology and the models, intuition, and assumptions behind it, as well as applications to real-world problems. Algorithms are implemented using the R programming language. **Prerequisite(s):** A grade of C or higher in MAT 211 and MAT 305.**MAT 411 Bayesian Data Analysis Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** An applied approach to Bayesian Data Analytics. This course starts with an introduction to Bayes rules and then uses concepts in calculus to develop Markov Chain Monte Carlo methods. Topics include, but are not limited to, Bayesian multiple linear regression, logistic regression, binomial models, and hierarchical models. **Prerequisite(s):** A grade of C or higher in MAT 217 or a grade of C or higher in CSC 184 and MAT 167.**MAT 416 Abstract Algebra Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Groups, rings, and fields; definitions and fundamental theorems; homomorphisms and isomorphisms; polynomials and field extensions. **Prerequisite(s):** A grade of C or higher in MAT 206 and MAT 306.**MAT 450 Independent Research/Project Credits: 1-3****Typically Offered:** Departmental Discretion.**Course Description:** Investigation of a research problem, project, or topic on an individual conference basis. May be repeated for credit.**Prerequisite(s):** Minimum of 2.5 GPA in major field, a grade of C or higher in MAT 287, and departmental approval.**MAT 462 Number Theory Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Study of divisibility, primes, congruencies, diophantine equations, arithmetic functions, partitions, Fibonacci numbers, and continued fractions. An independent method of study will be used.**Prerequisite(s):** A grade of C or higher in MAT 206.**MAT 465 Mathematics Teaching: Methods and Materials Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Techniques, materials, and resources used in the mathematics curriculum in secondary schools. Not appropriate for the major in mathematics without teacher certification. **Prerequisite(s):** A grade of C or higher in EDU 203 and credit or concurrent enrollment in MAT 206.**MAT 470 Seminar in Mathematics Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Selected topics in mathematics. May be repeated for credit. **Prerequisite(s):** Departmental approval.

Physics (PHY)

PHY 101 How Things Work Credits: 4**Typically Offered:** Fall.**Course Description:** A conceptual study of the physical principles that govern everyday life. Designed to provide an introduction to the scientific method and its application to today's technology to a broad audience without overwhelming them with mathematics. Provides an introduction to the terminology and concepts of a broad range of topics including motion, fluids, thermodynamics, energy, sound, light, and electricity. Three hours lecture, two hours lab. Not open to the student with credit in PHY 107, PHY 110, or PHY 210.**CORE 42:** MOTR PHYS 100L; Essentials in Physics with Lab (attributes MO38, MLAB)**PHY 104 Introduction to Astronomy Credits: 4****Typically Offered:** Fall, Spring.**Course Description:** Basic course in astronomy, mostly descriptive in nature; solar system, stellar astronomy, structure of galaxy and universe. Three hours lecture and two hours lab.**CORE 42:** MOTR ASTR 100L; Astronomy with Lab (attributes MO31, MLAB)**PHY 107 Introduction to Physics Credits: 4****Typically Offered:** Departmental Discretion.**Course Description:** A comprehensive, quantitative study of the concepts and laws of physics. Designed for students majoring in fields other than the physical sciences, mathematics, or engineering. Topics include motion, gravity, electromagnetism, atomic and nuclear physics, optics, and relativity. Three hours of lecture, two hours lab. Not open to the student with credit in PHY 110 or PHY 210. **Prerequisite(s):** ACT math subscore of at least 22 or a sufficient score on the math placement exam or a grade of C or higher in MAT 110 or MAT 110E or MAT 111 or MAT 111E or departmental approval.**CORE 42:** MOTR PHYS 110L; Essentials in Physical Sciences with Lab (attributes MO37, MLAB)**PHY 110 College Physics I Credits: 4****Typically Offered:** Fall, Spring.**Course Description:** Classical treatment of mechanics, energy, waves, and heat. Three hours lecture, three hours lab. Not open to students with credit in PHY 210. **Prerequisite(s):** Grade of C or higher in MAT 116.**CORE 42:** MOTR PHYS 150L; Physics I with Lab (attributes MO38, MLAB)**PHY 111 College Physics II Credits: 4****Typically Offered:** Spring.**Course Description:** Electricity, magnetism, optics, relativity, atomic physics and nuclear physics. Three hours lecture, three hours lab. Not open to students with credit in PHY 211. **Prerequisite(s):** PHY 110 or PHY 210.

PHY 210 University Physics I Credits: 5**Typically Offered:** Departmental Discretion.**Course Description:** This course is a comprehensive study of mechanics, relativity, oscillations, waves, and thermodynamics involving simulations, applications, and experimentation. Course assignments require the student to have a thorough knowledge of college algebra, trigonometry, and calculus. Three hours lecture, two hours computer aided instruction lab, two hours experimentation lab. **Prerequisite(s):** MAT 167.**CORE 42:** MOTR PHYS 200L; Advanced Physics I with Lab (attributes MO38, MLAB)**PHY 211 University Physics II Credits: 5****Typically Offered:** Departmental Discretion.**Course Description:** This course is a comprehensive study of electricity, magnetism, optics, and introductory quantum physics involving simulations, applications, and experimentation. Course assignments require the student to have a thorough knowledge of college algebra, trigonometry, and calculus. Three hours lecture, two hours computer aided instruction laboratory, two hours experimentation laboratory.**Prerequisite(s):** PHY 210 and MAT 177. MAT 287 recommended.**PHY 283 Introduction to Research Methods in Physics Credits: 1-2****Typically Offered:** Departmental Discretion.**Course Description:** Introduction to basic research methods in Physics. Individual and team projects involving methods for solving physics-related research problems. May be taken for up to 2 credit hours.**Prerequisite(s):** Departmental approval.**PHY 312 University Physics III Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Calculus-level modern physics. Three hours lecture.**Prerequisite(s):** PHY 211.**PHY 313 Modern Physics Laboratory Credits: 1****Typically Offered:** Departmental Discretion.**Course Description:** Selected experiments in modern physics. Three hours laboratory. **Prerequisite(s):** Credit or concurrent enrollment in PHY 111 or PHY 312.**PHY 410 Selected Topics in Physics Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Presentation of one of the following topics: 01-mathematical physics; 02-classical mechanics; 03-thermodynamics; 04-electricity and magnetism; 05-optics; 06-quantum mechanics; 07-astronomy; 08-solid state physics; 09-nuclear and particle physics; 10-computational physics. **Prerequisite(s):** Departmental approval.**PHY 450 Independent Research/Project Credits: 1-3****Typically Offered:** Departmental Discretion.**Course Description:** Investigation of a research problem, project, or topic on an individual conference basis. May be repeated for credit.**Prerequisite(s):** Minimum 2.5 GPA in minor field, and departmental approval.**PHY 465 Physics Teaching: Methods and Materials Credits: 2****Typically Offered:** Departmental Discretion.**Course Description:** Techniques, materials, and equipment used in teaching physics in secondary schools. **Prerequisite(s):** PHY 111 or PHY 312.

Faculty

Kevin Anderson (2001) Professor, Mathematics. Ph.D., Kansas State University.**Brian Bucklein** (2010) Associate Professor, Physics. Ph.D., Brigham Young University.**Jennifer Elder** (2023) Assistant Professor, Mathematics. Ph.D., Arizona State University.**Joseph Hall** (2023) Assistant Professor, Physics. B.S., Brigham Young University.**Sauna Hiley** (1997) Professor, Chemistry. Ph.D., University of Wyoming.**Lori McCune** (2012) Professor, Mathematics. Ph.D., University of Nebraska - Lincoln.**David McWilliams** (1996) Instructor, Mathematics. M.A., Missouri State University.**Jeff Poet** (2002) Professor, Mathematics. Ph.D., University of Wyoming.**Jon Rhoad** (2006) Professor, Chemistry. Ph.D., Ohio State University.**Glenn Rice** (2006) Professor, Mathematics. Ph.D., University of Kansas.**Alcinda Ruuskanen** (2021) Instructor, Chemistry. M.S., Oulu University of Applied Sciences.**Stan Svojanovsky** (2013) Associate Professor, Chemistry. Ph.D., University of Kansas.**Gavin Waters** (2006) Professor, Mathematics. Ph.D., University of Iowa.**Jeff Woodford** (2010) Professor, Chemistry. Ph.D., University of Nebraska - Lincoln.