

PHYSICAL SCIENCES

Programs

- Biochemistry/Molecular Biology, Bachelor of Science (<http://catalog.ben.edu/lisle-undergraduate/academic-programs/physical-sciences/biochemistry-molecular-biology-bs/>)
- Chemistry, Bachelor of Arts (<http://catalog.ben.edu/lisle-undergraduate/academic-programs/physical-sciences/chemistry-ba/>)
- Chemistry, Bachelor of Science (<http://catalog.ben.edu/lisle-undergraduate/academic-programs/physical-sciences/chemistry-bs/>)
- Physics, Bachelor of Science (<http://catalog.ben.edu/lisle-undergraduate/academic-programs/physical-sciences/physics-bs/>)
- Engineering Science, Bachelor of Arts (<http://catalog.ben.edu/lisle-undergraduate/academic-programs/physical-sciences/engineering-science-ba/>)
- Benedictine University IIT Joint Engineering Program (<http://catalog.ben.edu/lisle-undergraduate/academic-programs/physical-sciences/ben-iit-joint-engineering-program/>)
- Engineering Science Program (3+2 Program) (<http://catalog.ben.edu/lisle-undergraduate/academic-programs/physical-sciences/engineering-science-program/>)
- Pre-Engineering Transfer Program (<http://catalog.ben.edu/lisle-undergraduate/academic-programs/physical-sciences/pre-engineering-transfer-program/>)
- Chemistry, Minor (<http://catalog.ben.edu/lisle-undergraduate/academic-programs/physical-sciences/chemistry-minor/>)
- Physics, Minor (<http://catalog.ben.edu/lisle-undergraduate/academic-programs/physical-sciences/physics-minor/>)

Courses Chemistry

CHEM 1101 Introduction to Chemistry. (Formerly 101) The fundamental principles of chemistry with an introduction to inorganic chemistry; including acids, bases, gases, and solutions. Intended for nursing and allied health majors. A student cannot earn credit in CHEM 1101 after having earned a "C" or better in CHEM 1123 or CHEM 1127. IAI P1902 3 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall Term)

MESA

CHEM 1102 Introduction to Chemistry Laboratory. (Formerly 102)

Experiments that explore the principles discussed in CHEM 101.

Prerequisite: Registration or credit in CHEM 1101. A student cannot earn credit in CHEM 1102 after having earned a "C" or better in CHEM 1124 or CHEM 1125. IAI P1902L 1 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall Term)

MESA

CHEM 1103 Introduction to Organic Chemistry. (Formerly 103) The structure, nomenclature, and reactions of organic compounds and an introduction to biochemistry. Functional groups relevant to the chemistry of biological systems will be emphasized. Prerequisite: A "C" or better in CHEM 1101 or a "D" or better in CHEM 1123 or CHEM 1127. A student cannot earn credit in CHEM 1103 after having earned a "C" or better in CHEM 2247. 2 semester credit hour/s.

Designation: -

Campus: LISLE (Typically Offered: Fall and Spring Terms)

MESA (Typically Offered: Fall Term)

CHEM 1104 Introduction to Organic Chemistry and Biochemistry

Laboratory. (Formerly 104) Experiments examine the applications of organic and biochemical theory. Prerequisite: A "C" or higher in CHEM 1102 or CHEM 1114 OR CHEM 1124 OR CHEM 1125 and co-registration or credit in CHEM 1103. A student cannot earn credit in CHEM 1104 after having earned a "C" or better in CHEM 2248 or CHEM 2249. 1 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Spring Term)

MESA

CHEM 1108 Preparatory General Chemistry. (Formerly 108) Preparation for general chemistry. Learn about campus resources and important study skills including time management, notetaking, reading a textbook, and memorizing. Review necessary math skills such as fractions, order of operations, solving algebraic equations, interpreting data from graphs and tables and solving problems with base 10 exponents. Problems will be solved with and without a calculator to encourage mental math. Explore chemistry with topics including unit conversions, scientific notation, significant figures, the periodic table, chemical formulas, balancing chemical reactions, and stoichiometry. There is a focus on developing problem-solving skills and chemical reasoning. Course prerequisite: Credit or co-registration in MATH 1110 or a higher level MATH course. Undergraduate students – both degree-seeking and Students-At-Large (SAL) – may repeat CHEM 1108 if they received grades of "W" "D" or "F" no more than once. LC eligible. 3 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall Term)

MESA (Typically Offered: Spring Term)

CHEM 1109 Introduction to Biochemistry. (Formerly 109) The structures

and properties of carbohydrates, lipids, amino acids, proteins and enzymes; the fundamental pathways of fuel metabolism. Prerequisites: "C" or better in CHEM 1103 or CHEM 2247. A student cannot earn credit in CHEM 1109 after having earned a "C" or better in CHEM 3261 or CHEM 4361. 2 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall and Spring Terms)

MESA (Typically Offered: Fall Term)

CHEM 1113 General Chemistry I. (Formerly 113) Principles of stoichiometry, aqueous reactions, thermochemistry, electronic structure and bonding, periodicity, phase-related properties and functional groups.

A student cannot earn credit in CHEM 1113 after having earned a "C" or better in CHEM 1127. Prerequisite: One year of high school chemistry or a grade of "C" or better in CHEM 1108 or a 50th percentile or higher score on the chemistry placement exam; AND a grade of "C" or better in MATH 1110 or a higher-level MATH course or a MATH ACT score of 23 or higher or a 50th percentile or higher score on the chemistry placement exam or placement into MATH 1111 or a higher level MATH course. IAI CHM911 3 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)

MESA (Typically Offered: Fall Term)

CHEM 1114 General Chemistry I Laboratory. (Formerly 114) Separations, quantitative measurements and transfers, and spectrochemical techniques involving organic and inorganic systems. Prerequisite: Registration or credit in CHEM 1113 or CHEM 1127. A student cannot earn credit in CHEM 1114 after having earned a "C" or better in CHEM 1115. 1 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)
MESA (Typically Offered: Fall Term)

CHEM 1115 Honors General Chemistry I Laboratory. (Formerly 115) Intended for physical science, physics, engineering, chemistry and biochemistry/molecular biology majors or students interested in chemistry or biochemistry. The study and application of laboratory techniques and methods of chemical/biochemical analysis that includes a variety of chromatographic and spectroscopic methods, titrimetry, and sample preparation, data acquisition and statistical analysis, molecular modeling, laboratory safety, and scientific ethics. A student cannot earn credit in CHEM 1115 after having earned a "C" or better in CHEM 1114. Prerequisite: Credit or co-registration in CHEM 1113 or CHEM 1127. 1 semester credit hour/s. Department Consent Required.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall Term)

CHEM 1123 General Chemistry II. (Formerly 123) Gas laws, principles of intermolecular forces, kinetics, chemical equilibrium, acid/base chemistry, electrochemistry, and nuclear chemistry. A student cannot earn credit in CHEM 1123 after having earned a "C" or better in CHEM 1127.

Prerequisite: "C" or better in CHEM 1113; AND a grade of "C" or better in MATH 1110 or a higher-level MATH course or a MATH ACT of 23 or higher or placement into MATH 1111 or a higher level MATH course. IAI CHM912 3 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)
MESA (Typically Offered: Spring Term)

CHEM 1124 General Chemistry II Laboratory. (Formerly 124) Titrimetry, solubility, synthesis, qualitative analysis, and instrumentation for pH, kinetics, and electrochemical processes. Prerequisite: "C" or better in CHEM 1114 or CHEM 1115 and co-registration or credit in CHEM 1123 or credit in CHEM 1127. A student cannot earn credit in CHEM 1124 after having earned a "C" or better in CHEM 1125. 1 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)
MESA (Typically Offered: Spring Term)

CHEM 1125 Honors General Chemistry II Laboratory. (Formerly 125) Completion of the topics listed for CHEM 1115 and pH, electrochemistry, equilibrium, and inorganic synthesis. A student cannot earn credit in CHEM 1125 after having earned a "C" or better in CHEM 1124. Prerequisite: "C" or better in CHEM 1115, and credit in CHEM 1127 or credit or co-registration in CHEM 1123. LC Eligible. 1 semester credit hour/s. Department Consent Required.

Designation: Sustainability; Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Spring Term)

CHEM 1127 Honors General Chemistry. (Formerly 127) Intended for chemistry, physics and engineering majors or students interested in the physical sciences. Topics include electronic structure of atoms, bonding theories, periodicity, thermodynamics, intermolecular forces, kinetics, chemical equilibrium, acid/base chemistry, and electrochemistry. A student cannot earn credit in CHEM 1127 after having earned a "C" or better in CHEM 1113 or CHEM 1123. Prerequisite: Credit or co-registration in MATH 1170 or higher and one year of high school chemistry or equivalent. 4 semester credit hour/s. Department Consent Required.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall Term)

CHEM 1190 Selected Topics in Chemistry. (Formerly 190) Current topics in chemistry. 1 semester credit hour/s. Course Repeatable. Maximum number of units allowed: 12.

Campus: LISLE (Typically Offered: Periodically)

CHEM 2242 Organic Chemistry I. (Formerly 242) Introduction to cyclic and acyclic molecules, with an emphasis on organic acids and bases, reaction mechanisms and stereochemistry. Intended for physical and biological science students. Prerequisite: "C" or better in CHEM 1123 or CHEM 1127. IAI CHM913 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)
MESA (Typically Offered: Fall Term)

CHEM 2243 Organic Chemistry I Laboratory. (Formerly 243) Introduction to organic and biochemical laboratory techniques, separations, purifications and analysis. For non-chemistry majors. A student cannot earn credit in CHEM 2243 after having earned a "C" or better in CHEM 2244. Prerequisite: "C" or better in CHEM 1124 or CHEM 1125 and credit or co-registration in CHEM 2242. 1 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)
MESA (Typically Offered: Fall Term)

CHEM 2244 Honors Organic Chemistry I Laboratory. (Formerly 244) Introduction to organic and biochemical laboratory techniques, separations and purifications, with an emphasis on chemical instrumentation. Intended for chemistry and biochemistry/molecular biology majors. A student cannot earn credit in CHEM 2244 after having earned a "C" or better in CHEM 2243. Prerequisite: "C" or better in CHEM 1124 or 1125, and credit or co-registration in CHEM 2242. 1 semester credit hour/s. Department Consent Required.

Campus: LISLE (Typically Offered: Fall Term)

CHEM 2247 Organic Chemistry II. (Formerly 247) Organic synthesis. A study of the preparations and reactions of aliphatic and aromatic organic compounds and their inter-conversions. Prerequisite: "C" or better in CHEM 2242. IAI CHM914 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)
MESA (Typically Offered: Fall, Spring, and Summer Terms)

CHEM 2248 Organic Chemistry II Laboratory. (Formerly 248) The synthesis, isolation and identification of organic compounds. For non-chemistry majors. A student cannot earn credit in CHEM 2248 after having earned a "C" or better in CHEM 2249. Prerequisite: "C" or better in CHEM 2243 and credit or co-registration in CHEM 2247. 1 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)
MESA (Typically Offered: Fall, Spring, and Summer Terms)

CHEM 2249 Honors Organic Chemistry II Laboratory. (Formerly 249) The synthesis, isolation and identification of organic compounds with an emphasis on spectroscopic analysis. For chemistry and biochemistry/molecular biology majors. A student cannot earn credit in CHEM 2249 after having earned a "C" or better in CHEM 2248. Prerequisite: "C" or better in CHEM 2244 and credit or co-registration in CHEM 2247. LC Eligible. 1 semester credit hour/s. Department Consent Required.

Designation: Sustainability

Campus: LISLE (Typically Offered: Spring Term)

CHEM 2295 Chemistry Teaching. (Formerly 295) Opportunity for a student to work as a teaching assistant in the chemistry department. 3 semester credit hour/s. Course Repeatable. Maximum number of units allowed: 12. Department Consent Required.

Designation: Engaged Learning

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)

CHEM 3000 Fundamentals of Thermodynamics. Overview of the math and physics concepts necessary for success in thermodynamics – introductory multivariate calculus, partial derivatives, temperature and heat, equations of state, thermal properties of matter, the laws of thermodynamics and related physical changes. Prerequisite: "C" or better in PHYS 1118, "C" or better in MATH 2211, and "C" or better in CHEM 1127 or CHEM 1123. Students who have earned credit in CHEM/PHYS 4313 may not earn credit in CHEM 3000. 1 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall Term)

CHEM 3231 Instrumental Analysis. (Formerly 231) Statistical analysis of data, and the theory and applications of instrumental analysis including spectroscopy, chemical separation, and mass spectrometry. Prerequisite: "C" or better in CHEM 1123 or CHEM 1127, and "C" or better in CHEM 1124 or CHEM 1125. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall Term)

CHEM 3232 Quantitative Analysis. (Formerly 232) Sampling and the theory and applications of gravimetric, titrimetric, electrochemical, thermal, automated and computer assisted methods of analysis. Prerequisite: "C" or better in CHEM 1123 or CHEM 1127, and "C" or better in CHEM 1124 or CHEM 1125. 3 semester credit hour/s.

Designation: Sustainability

Campus: LISLE (Typically Offered: Spring Term)

CHEM 3234 Materials Science. An interdisciplinary course concentrated on studying the mechanical, electrical, chemical, and thermal properties of material systems such as composites, polymers, semiconductors, biomaterials and nanomaterials. The emphasis will be on understanding the science behind contemporary technological applications and the role materials play in technology, biomedical engineering, renewable energy engineering, and environmental sustainability. Prerequisite: "C" or better in PHYS 1118 or PHYS 2213; and a "C" or better in CHEM 1123. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Periodically)

CHEM 3237 Instrumental Analysis Lab. (Formerly 237) Optimization, operation, and applications of selected instrumental methods discussed in CHEM 3231. Prerequisite: Credit or co-registration in CHEM 3231, "C" or better in CHEM 1124 or 1125. 1 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall Term)

CHEM 3238 Quantitative Analysis Lab. (Formerly 238) Preparation of buffers, standard addition methods, and standardization of acid/base solutions. Quantitative analysis methods including gravimetry, titrations, potentiometry, voltammetry, and amperometry that are discussed in CHEM 3232. Prerequisite: Credit or co-registration in CHEM 3232, "C" or better in 1124 or 1125. 1 semester credit hour/s.

Campus: LISLE (Typically Offered: Spring Term)

CHEM 3261 Principles of Biochemistry. (Formerly BCHM 261) The structures, properties and functions of carbohydrates, lipids, proteins, and nucleic acids and their reactions in metabolic pathways are emphasized. Systematic naming, essential terminology, acid/base chemistry, biocatalysis, bioenergetics, intermolecular interactions, and the importance of electrolytes and buffers for biomolecules are also described. Students cannot earn credit in CHEM 3261 if they have already completed CHEM 4361 with a grade of C or better. Prerequisite: A "C" or better in CHEM 2247 and a "C" or better in BIOL 1198. 3 semester credit hour/s.

Designation: -

Campus: LISLE (Typically Offered: Fall and Spring Terms)
MESA

CHEM 4313 Classical Thermodynamics. (Formerly 313) Properties of gases, relating heat and work, concepts of enthalpy and entropy, laws of thermodynamics, heat engines, thermodynamics of mixing processes, and phase changes. Prerequisite: "C" or better in CHEM 1123 or CHEM 1127, PHYS 2213, and MATH 2212. Cross listed as CHEM 4313/PHYS 4313. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall Term)

CHEM 4314 Physical Chemistry I Laboratory. (Formerly 314) Applies principles discussed in CHEM 4313/PHYS 4313. Prerequisite: Co-registration or credit in CHEM 4313/PHYS 4313. Cross listed as CHEM 4314/PHYS 4314. 1 semester credit hour/s.

Designation: Writing Intensive

Campus: LISLE (Typically Offered: Fall Term)

CHEM 4315 Quantum and Statistical Mechanics. (Formerly 315) Failures of classical physics, development of quantum theory, atomic structure and spectra, statistical mechanics, and statistical thermodynamics. Prerequisites: "C" or better in CHEM 4313/PHYS 4313 Cross listed as CHEM 4315/PHYS 4315. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Spring Term)

CHEM 4316 Physical Chemistry II Laboratory. (Formerly 316) Applies principles discussed in CHEM 4315/PHYS 4315. Prerequisite: Credit or co-registration in CHEM 4315/PHYS 4315. Cross-listed as CHEM 4316/PHYS 4316. 1 semester credit hour/s.

Designation: Writing Intensive

Campus: LISLE (Typically Offered: Spring Term)

CHEM 4320 Inorganic Chemistry. (Formerly 320) Principles of structure and bonding, coordination chemistry, organometallic chemistry, and descriptive chemistry. Prerequisite: "C" or better in CHEM 2247. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall Term)

CHEM 4321 Inorganic Synthesis Laboratory. (Formerly 321) Applications of the topics discussed in CHEM 4320 including vacuum-line manipulation, inert atmosphere techniques, spectroscopy, and separation methods. Prerequisite: "C" or better in CHEM 4320. 1 semester credit hour/s. Department Consent Required.

Designation: Writing Intensive

Campus: LISLE (Typically Offered: Spring Term)

CHEM 4322 Bioinorganic Chemistry. (Formerly 322) Selected lecture topics include transition metals in biological systems, metals in photosynthesis, metal homeostasis, inorganic compounds in medicine, spectroscopy, and biological coordination compounds. Prerequisite: "C" or better in CHEM 2247. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Periodically)

CHEM 4334 Bioanalytical Chemistry and Chemical Sensors. (Formerly 334) Selected lecture topics in spectroscopy, separations, and electrochemistry of biological macromolecules; immunoassays, enzymatic assays, nanomaterials, microfluidic systems, and development and optimization of biological/chemical sensors. Prerequisite: "C" or better in CHEM 3231 and 2247. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Periodically)

CHEM 4340 Advanced Organic Chemistry. (Formerly 340) Selected topics in synthetic organic chemistry, emphasizing current reaction methodologies, catalysis and asymmetric transformations. Prerequisite: "C" or better in CHEM 2247. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Periodically)

CHEM 4342 Organometallic Chemistry. (Formerly 342) Synthesis of organometallic complexes, their structure and bonding, and as catalysts in synthesis of organic compounds, with an emphasis on mechanism and application. Prerequisite: "C" or better in CHEM 2247. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Periodically)

CHEM 4347 Medicinal Chemistry. (Formerly 347) This course will investigate the role of organic chemistry in the design and mechanism of drugs. The principles of drug discovery, drug development, drug/receptor interactions and structure/activity relationships will be covered. Prerequisite: "C" or better in CHEM 2247. CHEM 4347 is cross-listed with BIOL 5347. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Periodically)

MESA

CHEM 4357 Molecular Dynamics and Kinetics. (Formerly 357) Electronic properties of molecules, molecular interactions, molecular motion, chemical kinetics, molecular reaction dynamics. Prerequisite: Credit or Co-registration in CHEM 4357/PHYS 4315. Cross listed as CHEM 4357/PHYS 4357. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Periodically)

CHEM 4361 Biochemistry. (Formerly BCHM 361) The structure and function of the major chemical components of biological systems are described. The major topics include water, buffers and pH; proteins; enzymes; carbohydrates; lipids; and vitamins. (Students cannot earn credit in both CHEM 3261 and 4361). Pre-requisite: "C" or better in CHEM 2247. 3 semester credit hour/s.

Designation: -

Campus: LISLE (Typically Offered: Fall Term)

CHEM 4362 Protein Biochemistry Lab. (Formerly BCHM 362) A laboratory course in which protein purification and characterization will be carried out. In addition, enzyme assays, Michaelis-Menten kinetics, and ligand binding to proteins will be explored. This course is intended for Biochemistry/Molecular Biology majors. Pre-requisite: "C" or better in BIOL 2260 and credit or co-registration in CHEM 4361. 1 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall Term)

CHEM 4365 Cellular Metabolism. (Formerly BCHM 365) The major metabolic pathways and cellular bioenergetics are discussed. An emphasis is placed upon the chemistry of these processes. Pre-requisite: "C" or better in CHEM 3261. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Spring Term)

CHEM 4390 Selected Topics in Chemistry. (Formerly 390) Current advanced topics in Chemistry. 1-3 semester credit hour/s. Course Repeatable. Maximum number of units allowed: 12.

Campus: LISLE (Typically Offered: Periodically)

CHEM 4393 Chemical Internship. (Formerly 393) Practical experiences in chemistry under the supervision of the chemistry program. 1-12 semester credit hour/s. Course Repeatable. Maximum number of units allowed: 12. Department Consent Required.

Designation: Engaged Learning

Campus: LISLE (Typically Offered: Fall and Spring Terms)

CHEM 4398 Chemical Research. (Formerly 398) Original experimental research conducted under the supervision of a faculty or adjunct faculty member. Projects may be conducted on campus or at an affiliated research facility. Publication and public presentation of the research are course objectives. 3 semester credit hour/s. Course Repeatable. Maximum number of units allowed: 18. Department Consent Required.

Designation: Engaged Learning

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)

CHEM 4399 Research Capstone. (Formerly 399) This course is intended for final semester seniors finishing their research experience, where students will focus on writing a research thesis and engaging in a public presentation. 1-2 semester credit hour/s. Department Consent Required.

Designation: Engaged Learning

Campus: LISLE (Typically Offered: Fall and Spring Terms)

Engineering

ENGR 1100 Introduction to the Engineering Profession. (Formerly 100)

This course is an introduction to the field of engineering designed for students entering or considering the engineering profession as a career path. The course consists of hands-on projects, where students will learn the basics of the engineering design process, as well as presentations by outside speakers who will discuss specifics about the different fields of engineering. 1 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall Term)

ENGR 1110 Engineering Design. (Formerly 110) A hands-on course where students learn the engineering design process and problem solving through the implementation and completion of projects from different fields of engineering. During the course students will work in groups to develop skills in design, teamwork, technical writing, and presentations. 3 semester credit hour/s.

Designation: Writing Intensive; Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Spring Term)

ENGR 1120 Engineering Graphics. (Formerly 120) Fundamentals of engineering communications employing applied geometry in instrument and CAD presentation and interpretation of orthographic, sectional, intersection, development and pictorial views. Introduction to basic machine elements and 3D design. 2 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall Term)

ENGR 2220 Statics. (Formerly PHYS 220) This class covers the principles of mechanics and their application to static engineering problems. The course includes both lecture and lab components designed to stimulate students' understanding of equilibrium concepts in mechanics. Vector analysis will be discussed as a useful tool. Topics will include: statics of particles, rigid bodies: (equivalent systems of forces, equilibrium of rigid bodies), distributed forces (centroids and centers of gravity, analysis of structures, internal forces and moments, friction, moments of inertia). Prerequisite: "C" or higher in PHYS 2211, and credit/co-registration in MATH 2211. IAI EGR942 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall Term)

ENGR 3221 Dynamics. (Formerly PHYS 221) This class covers the principles of mechanics and its application to dynamic physics and engineering problems. The topics include (but not limited to): kinematics of particles, kinetics of particles (Newton's second law, energy and momentum methods), systems of particles, kinematics of rigid bodies, plane motion of rigid bodies (forces and accelerations, energy and momentum methods, mechanical vibrations). Prerequisite: "C" or better in PHYS 2220 or ENGR 2220 and credit or co-registration in MATH 2260. 3 semester credit hour/s.

Designation: -

Campus: LISLE (Typically Offered: Spring Term, Even Years)

ENGR 3264 Electronics. (Formerly PHYS 264) An integrated laboratory and lecture course designed to cover the basic principles of modern electronics. Topics include AC and DC circuits, linear and non-linear devices, nodal analysis, mesh analysis, power supplies, operational amplifiers, logic circuits, and Laplace transforms. Lecture and laboratory work are integrated allowing the students to test theories through projects and experiments. Prerequisite: "C" or better in PHYS 2212 and MATH 2211. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Spring Term, Odd Years)

ENGR 3330 Renewable Energy Engineering I. An interdisciplinary course concentrated on studying the renewable energy sources, including solar and wind, as well as energy storage technologies such as batteries.

The emphasis will be on understanding the science behind these technologies, their contemporary applications, and the prospect for environmental sustainability. Pre-requisite: "C" or better in PHYS 1118 or PHYS 2212 and "C" or better in CHEM 1123. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall Term)

ENGR 3331 Renewable Energy Engineering II. An interdisciplinary course concentrated on studying the renewable energy sources, including solar and wind, as well as energy storage technologies such as batteries.

The emphasis will be on understanding the science behind these technologies, their contemporary applications, and the prospect for environmental sustainability. Pre-requisite: "C" or better in PHYS 1118 or PHYS 2212 and "C" or better in CHEM 1123. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall Term)

ENGR 4393 Engineering Internship. Practical experience in engineering or related career areas under the supervision of the engineering program. Prerequisite: consent of faculty coordinator. 15 semester credit hour/s. Course Repeatable. Maximum number of units allowed: 24. Department Consent Required.

Designation: Engaged Learning

Campus: LISLE (Typically Offered: Periodically)

ENGR 4398 Engineering Research. Research in engineering conducted under the supervision of a faculty or adjunct faculty member. Publication and public presentation of the research are course objectives.

Prerequisite: departmental consent. 3 semester credit hour/s. Course Repeatable. Maximum number of units allowed: 24. Department Consent Required.

Designation: Engaged Learning

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)

Physics

PHYS 1101 Physical Science. (Formerly 101) An introduction to the basic concepts of physics and scientific reasoning relating to the experiences encountered in the everyday physical environment. For non-science majors. Prerequisite for PHYS 1101: "C" or better in MATH 0095. IAI P9900 3 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall and Spring Terms)
MESA

PHYS 1105 Big Ideas in Physics. The big ideas in 20th and 21st century physics will be presented in a largely non-quantitative, conceptual format intended for non-science majors. The ideas that have revolutionized the modern world will be discussed, including quantum mechanics, special and general relativity, and electronics. Prerequisite: "C" or better in MATH 95. 3 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Periodically)

PHYS 1106 Astronomy. (Formerly 106) Examines astronomical phenomena and concepts including the solar system, stars, galaxies, planetary motion and the evolution of the universe. IAI P1906 3 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)
MESA

PHYS 1107 Earth and Space Science. (Formerly 107) A physical science laboratory course that includes the study of key principles of Earth and Space Science through the investigation of real world problems. The earth science component includes the study of large-scale dynamic forces, events, and processes that affect the Earth's land, water, and atmospheric systems, identification and evaluation of the uses of the Earth's resources, and the processes involved in the life cycle. The space science component focuses on concepts that explain the composition, structure of and changes in the universe and Earth's place in it. By working and studying within the context of a real world problem, students learn how scientific principles are used and applied in everyday life. 4 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Spring Term)
MESA

PHYS 1113 College Physics I. (Formerly 113) A non-calculus based introduction to general physics topics that include vectors, classical mechanics, fluids, thermodynamics, and wave phenomena. Prerequisite: "C" or better in MATH 1111 or placement into MATH 1170 or a higher-level math course. IAI P1900 3 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)
MESA

PHYS 1114 College Physics I Laboratory. (Formerly 114) Selected experiments to illustrate the concepts studied in PHYS 1113. Prerequisite: credit or co-registration in PHYS 1113. IAI P1900L 1 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)
MESA

PHYS 1118 College Physics II. (Formerly 118) A non-calculus based introduction to general physics topics that include electromagnetism, electric circuits, geometrical and physical optics, atomic physics, and nuclear physics. Prerequisite: "C" or better in PHYS 1113. 3 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)

MESA (Typically Offered: Fall, Spring, and Summer Terms)

PHYS 1119 College Physics II Laboratory. (Formerly 119) Selected experiments to illustrate the concepts studied in PHYS 1118.

Prerequisite: "C" or better in PHYS 1114 and credit or co-registration in PHYS 1118. 1 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)

MESA (Typically Offered: Fall, Spring, and Summer Terms)

PHYS 1141 PHY141 - Physics I. (Formerly 141) Consortium course offered at North Central College. 3 semester credit hour/s. Department Consent Required.

Campus: LISLE

PHYS 1142 PHY141 - Physics I Lab. (Formerly 142) Consortium course offered at North Central College. 1 semester credit hour/s. Department Consent Required.

Campus: LISLE

PHYS 2205 University Physics I Laboratory. (Formerly 205) Laboratory course which introduces topics and concepts presented in PHYS 2211 through the use of experimental methods and techniques. Topics to be covered include vectors, statics, dynamics, work, energy, collisions, and rotational motion. Prerequisite: Credit or co-registration in PHYS 2211. 1 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Spring Term)

MESA (Typically Offered: Spring Term)

PHYS 2206 University Physics II Laboratory. (Formerly 206) Laboratory course which introduces topics and concepts of introductory physics through the use of experimental methods and techniques. Topics to be covered include electromagnetism, introductory circuits, and geometrical and physical optics. Prerequisite: Co-registration or credit in PHYS 2212. 1 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall Term)

MESA (Typically Offered: Fall Term)

PHYS 2207 University Physics III Laboratory. (Formerly 207) Laboratory course which introduces topics and concepts presented in physics 2213 through the use of experimental methods and techniques.

Topics to be covered include: propagation of light, geometric optics, interference, diffraction, periodic motion, mechanical waves, sound, and thermodynamics. Prerequisite: "C" or better in PHYS 2205 or 2206 and credit or co-registration in PHYS 2213. 1 semester credit hour/s.

Designation: -

Campus: LISLE (Typically Offered: Spring Term)

PHYS 2211 University Physics I. (Formerly 211) A calculus based introduction to mechanics. Topics include: vectors, Newton's laws, kinematics, dynamics, work, energy conservation, vibrations, momentum, rotations, equilibrium and elasticity, and fluid mechanics. Prerequisite: "C" or better in MATH 2210 (Calculus I); or "C" or better in MATH 1170 and Co-registration in MATH 2200. 3 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Spring Term)

MESA (Typically Offered: Spring Term)

PHYS 2212 University Physics II. (Formerly 212) A calculus based introduction to electricity, magnetism, and electric circuits. Topics include: electrostatics, Gauss's law, electric potential, capacitance, AC and DC electric circuits, magnetism, electromagnetic induction, electromagnetic waves. Prerequisite: "C" or better in PHYS 2211 and credit or Co-Registration in MATH 2211 3 semester credit hour/s.

Designation: Physical-Scientific (QPS)

Campus: LISLE (Typically Offered: Fall Term)

MESA (Typically Offered: Fall Term)

PHYS 2213 University Physics III. (Formerly 213) A calculus based introduction to waves, optics and thermodynamics. Topics include: The nature and propagation of light, geometric optics, interference, diffraction, periodic motion, mechanical waves, sound and hearing, laws of thermodynamics, special relativity, and quantization. Prerequisite: "C" or better in PHYS 2211 and credit in MATH 2211. 3 semester credit hour/s.

Designation: -

Campus: LISLE (Typically Offered: Spring Term)

PHYS 2296 Physics Teaching. (Formerly 296) Teaching assistant. 1-2 semester credit hour/s. Course Repeatable. Maximum number of units allowed: 2. Department Consent Required.

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)

PHYS 3208 Modern Physics Laboratory. (Formerly 208) Experimental physics course designed to cover laboratory methods and techniques that apply to topics from Modern Physics. Topics to be covered include electron charge to mass ratio, crystal scattering, spectroscopy, blackbody radiation, scanning probe microscopy, photon, tunneling, lasers, semiconductor devices, holography, radioactive decay, and the photoelectric effect. Prerequisite: Credit or co-registration in PHYS 3214. 1 semester credit hour/s.

Designation: Writing Intensive

Campus: LISLE (Typically Offered: Fall Term, Even Years)

PHYS 3214 Modern Physics. (Formerly 214) A calculus based introduction to concepts of 21st century and modern physics. Topics include: special relativity, quantum mechanics, solid state physics, atomic physics, nuclear physics, particle physics, and cosmology. Prerequisite: "C" or better in PHYS 2212. Writing-intensive (WI). 3 semester credit hour/s.

Designation: Writing Intensive

Campus: LISLE (Typically Offered: Fall Term)

PHYS 3234 Materials Science. An interdisciplinary course concentrated on studying the mechanical, electrical, chemical, and thermal properties of material systems such as composites, polymers, semiconductors, biomaterials and nanomaterials. The emphasis will be on understanding the science behind contemporary technological applications and the role materials play in technology, biomedical engineering, renewable energy engineering, and environmental sustainability. Prerequisite: "C" or better in PHYS 1118 or PHYS 2213; and a "C" or better in CHEM 1123. 3 semester credit hour/s.

Campus: LISLE

PHYS 3291 Selected Topics. (Formerly 291) Current topics in physics or biophysics. Prerequisite: Dependent upon topic. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Periodically)

PHYS 3323 Biophysics. (Formerly 323) An introduction to the use of physics methods, mathematics, and modeling in biological systems. Prerequisites: "C" or better in BIOL 1198, CHEM 1123 or CHEM 1127, PHYS 1118 or 2213, and MATH 2211. 3 semester credit hour/s.

Designation: -

Campus: LISLE (Typically Offered: Periodically)

PHYS 3350 Introduction to Astrophysics. An introduction to astrophysics. Includes basic celestial mechanics, optics and instrumentation, stellar atmospheres, stellar interiors, degenerate stellar remnants, basic relativity, the properties and distribution of the solar system, the nature and formation of galaxies and introductory cosmology. Prerequisites "C" or better in PHYS 2211 or PHYS 1113 and "C" or better in MATH 2211. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Periodically)

PHYS 4313 Classical Thermodynamics. (Formerly 313) Properties of gases, relating heat and work, concepts of enthalpy and entropy, laws of thermodynamics, heat engines, thermodynamics of mixing processes, and phase changes. Prerequisite: "C" or better in CHEM 1123 or CHEM 1127, PHYS 2213, and MATH 2212. Cross listed as CHEM 4313/PHYS 4313. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Fall Term)

PHYS 4314 Physical Chemistry I Laboratory. (Formerly 314) Applies principles discussed in CHEM 4313/PHYS 4313. Prerequisite: Co-registration or credit in CHEM 4313/PHYS 4313. Cross listed as CHEM 4314/PHYS 4314. 1 semester credit hour/s.

Designation: Writing Intensive

Campus: LISLE (Typically Offered: Fall Term)

PHYS 4315 Quantum and Statistical Mechanics. (Formerly 315) Failures of classical physics, development of quantum theory, atomic structure and spectra, statistical mechanics, and statistical thermodynamics. Prerequisites: "C" or better in CHEM 4313/PHYS 4313 Cross listed as CHEM 4315/PHYS 4315. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Spring Term)

PHYS 4316 Physical Chemistry II Laboratory. (Formerly 316) Applies principles discussed in CHEM 4315/PHYS 4315. Prerequisite: Credit or co-registration in CHEM 4315/PHYS 4315. Cross-listed as CHEM 4316/PHYS 4316. 1 semester credit hour/s.

Designation: Writing Intensive

Campus: LISLE (Typically Offered: Spring Term)

PHYS 4340 Electricity and Magnetism I. (Formerly 340) Theoretical study of classical electrostatics and electrodynamics. Topics include vector calculus of the electromagnetic field, electric field and potential, conductors, Laplace equations, boundary value problems, multipoles, polarization, dielectrics, magnetostatics, divergence and curl of the magnetic field, magnetization, Ampere's law, electrodynamics, electromagnetic induction, and Maxwell's equations, and an introduction to superconductivity formalism. Prerequisites: "C" or better in PHYS 2212 and MATH 2260. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Periodically)

PHYS 4357 Molecular Dynamics and Kinetics. (Formerly 357) Electronic properties of molecules, molecular interactions, molecular motion, chemical kinetics, molecular reaction dynamics. Prerequisite: Credit or Co-registration in CHEM 4357/PHYS 4315. Cross listed as CHEM 4357/PHYS 4357. 3 semester credit hour/s.

Campus: LISLE (Typically Offered: Periodically)

PHYS 4390 Selected Topics in Physics. (Formerly 390) Lecture course covering topics with which the student has not become acquainted in formal course work. May be an extension of or supplement to material previously encountered or material from a completely new area. Prerequisite: PHYS 2213 and MATH 2260. 3 semester credit hour/s. Course Repeatable. Maximum number of units allowed: 12.

Campus: LISLE (Typically Offered: Periodically)

PHYS 4393 Internship. (Formerly 393) Practical experience in physics or related career areas under the supervision of the physics program. Prerequisite: consent of faculty coordinator. 12 semester credit hour/s. Course Repeatable. Maximum number of units allowed: 12.

Designation: Engaged Learning

Campus: LISLE (Typically Offered: Periodically)

PHYS 4395 Independent Study. (Formerly 395) Designed to encourage desire in superior students to continue the study of physics beyond the scope of undergraduate course offerings through guided independent study. 2 semester credit hour/s. Course Repeatable. Maximum number of units allowed: 12.

Campus: LISLE (Typically Offered: Periodically)

PHYS 4398 Research. (Formerly 398) Original research in physics conducted under the supervision of a faculty or adjunct faculty member. Publication and public presentation of the research are course objectives. Prerequisite: departmental consent. 3 semester credit hour/s. Course Repeatable. Maximum number of units allowed: 18. Department Consent Required.

Designation: Engaged Learning

Campus: LISLE (Typically Offered: Fall, Spring, and Summer Terms)

Faculty Faculty

Darya Aleinikava (2013), Ph.D.

Physics Laboratory Coordinator, Physics and Engineering

Associate Professor, Physical Sciences

Ph.D. 2012, Physics, Graduate Center, City University of New York

M. Phil. 2008, Physics, Physics, Graduate Center, City University of New York

B.S. and M.S, Physics, 2005 and 2006, Belarussian State University

Casey Larsen (2016), Ph.D.

Chemistry and Biochemistry

Assistant Professor, Physical Sciences

Ph.D. 2012, University of California, San Diego

M.A. 2011, San Diego State University

B.S. 2004, San Diego State University

Brooks Maki (2017), Ph.D.

Chemistry and Biochemistry

Associate Professor, Physical Sciences

Ph. D. 2009, Northwestern University

B. A. 2004, Gustavus Adolphus College

Timothy Marin (2003), Ph.D.

Chemistry and Biochemistry

Professor, Physical Sciences

Ph.D. 2001, Northwestern University

M.S. 1997, Northwestern University

B.S. 1996, Benedictine University

Cheryl Mascarenhas (2003), Ph.D.

Dean, College of Science & Health, Chemistry and Biochemistry

Professor, Physical Sciences
Ph.D. 2002, University of North Carolina at Chapel Hill
B.S. 1997, Bridgewater College

Madhavan Narayanan (2020), Ph.D.

Chemistry and Biochemistry
Assistant Professor, Physical Sciences
Ph. D, 2011, Temple University
M.Sc 1999, Indian Institute of Technology Bombay
B.Sc, 1994, University of Madras

Rosemary Rakers (2017), Ph.D.

Chemical Hygiene Officer, General Chemistry Laboratory Coordinator,
Chemistry
Assistant Professor, Physical Sciences
Ph.D. 2008, Chemistry, Northern Illinois University
B.A. 1994, Chemistry, Trinity Christian College.

Niina Ronkainen (2004), Ph.D.

Chemistry and Biochemistry
Professor, Physical Sciences
Ph.D. 2003, University of Cincinnati
B.S. 1997, Butler University

David Rubush (2014), Ph.D.

Chemistry Program Director, Organic Chemistry Laboratory Coordinator,
Chemistry and Biochemistry
Associate Professor, Physical Sciences
Ph.D. Chemistry, 2012, Colorado State University
B.S. Chemistry, 2006, Calvin University

Stevce Stefanoski (2017), Ph.D.

Physics and Engineering
Associate Professor, Physical Sciences
Ph.D. 2012, Applied Physics, University of South Florida
M.S. Applied Physics, 2010, University of South Florida
B.S. Applied Physics, 2005, St. Cyril and Methodius University, Macedonia

Matthew Wiesner (2016), Ph.D.

Physics and Engineering
Associate Professor, Physical Sciences
Ph.D. 2014, Northern Illinois University
M.A. 2010, Northern Illinois University
M.A., 2007, Marquette University
B.S., 2003, Marquette University

Andrew Wig (2005), Ph.D.

Department Chair Physical Sciences, Program Director Physics and
Engineering, Laser/Radiation Safety Officer, Physics and Engineering
Professor, Physical Sciences
Ph. D. 2000, Physics, University of Tennessee
M. S. 1995, Physics, University of Tennessee
B. S. 1991, Physics, North Park College

Faculty Emeritus

Joseph C. Bowe, Ph.D.

Physics
Professor Emeritus, Physical Sciences

Duane J. Buss, Ph.D.

Physics
Professor Emeritus, Physical Sciences

Edward L. Ferroni, Ph.D.

Chemistry
Professor Emeritus, Physical Sciences

James J. Hazdra, Ph.D.

Chemistry
Professor Emeritus, Physical Sciences

Ralph D. Meeker, Ph.D.

Physics
Professor Emeritus, Physical Sciences

David J. Rausch, Ph.D.

Chemistry
Professor Emeritus, Physical Sciences

Fr. William J. Shonka, O.S.B., Ph.D.

Physics
Professor Emeritus, Physical Sciences

David Sonnenberger, Ph.D.

Chemistry
Professor Emeritus, Physical Sciences

John J. Spokas, Ph.D.

Physics
Professor Emeritus, Physical Sciences

Rev. Cyprian Tomecko, O.S.B., Ph.D.

Chemistry
Professor Emeritus, Physical Sciences

Wayne E. Wesolowski, Ph.D.

Chemistry
Professor Emeritus, Physical Sciences

E. Michael Winkler, Ph.D.

Chemistry
Professor Emeritus, Physical Sciences

Lecturers

William R. Schubert, M.S.

Lecturer, Engineering Science

Mel Swieton, M.S.

Lecturer, Physics

Lawrence Zintek, Ph.D.

Lecturer, Chemistry

The lecturers listed are individuals who have been employed as instructors on an as-needed basis, within the last several years, to teach courses at Benedictine University. Instructors listed may not currently be employed by Benedictine University. The University is fortunate to be able to provide our students with part-time faculty whose experience, credentials and commitment to education add to the high quality of our resident faculty.