Washington College course list for WashU prerequisites

** Please see Washington University program webpage for the definitive list of course requirements

Washington University Requirement	Washington College Equivalent with Course Descriptions
Chemistry: one semester of general chemistry with lab	**CHE 120. Chemical Principles of Organic Molecules.** This one-semester course provides a foundation in the fundamental principles of chemical structure and reactivity of organic molecules. Key topics include atomic and molecular structure, intramolecular and intermolecular forces, organic functional groups, thermochemistry, acid/base equilibria, kinetics, and basic organic reaction mechanisms. Laboratory work is designed to complement lecture material. Three hours of lecture and three hours of laboratory work each week.
Computer Programming: one course or certified proficiency in a high-level language (exposure to MATLAB preferred for Biomedical Engineering, Chemical Engineering and Mechanical Engineering)	**CSI 201. Computer Science I.** The objectives of this course are threefold: (a) to introduce problem-solving methods and algorithmic development; (b) to teach an object-oriented programming language; and c) to teach how to design, code, debug, and document programs in an object-oriented environment using techniques of good programming style. OR **PHY 252. Scientific Modeling and Data Analysis.** This course serves as a focused introduction to programming for scientists and engineers. Topics include algorithm development, statistical tests, the fast Fourier transform (FFT), simulating the dynamics of systems represented by coupled ordinary differential equations (e.g. planetary motion via Runge-Kutta methods), numerical integration, root finding, fitting functions to experimental data, and the creation of publication-quality graphics. Students choose and complete an independent research project on a topic related to their major. This course enables students to integrate computation into advanced courses in theoretical and/or experimental science. Programming language: Python.
English Composition: one course, acceptable examination scores, or college certification of proficiency	**FYS. 101. First Year Seminar.** Washington College's First-Year Seminar program introduces new college students to the excitement of critical inquiry and learning, and to the key academic skills required for sustained collegiate success. FYS courses cover a wide range of topics, but all share three essential elements: the passion of a dedicated instructor, a small-seminar format where students contribute and learn from each other, and a sustained focus on careful reading, sound research, thoughtful discussion, and clear writing—the 'habits of critical inquiry' at the heart of liberal education. All FYS courses introduce students to library research and information literacy; offer instruction on the writing process, rhetorical knowledge, and academic conventions; and include significant research, writing, revision, and presentation work. FYS courses satisfy the W1 component of the college's Writing Program.
Humanities & Social Sciences: no fewer than 15 semester hours in approved areas (This sequence must include six semester hours in Humanities and three semester hours in Social Sciences)	All Washington College students must take the following (to be completed before the end of their third year at Washington College): 1. Humanities and Fine Arts courses totaling 12 credit hours, at least 4 of which must be Humanities. 2. Foreign language courses totaling at least 4 credit hours (contributes to humanities requirement at Washington University). 3. Social Science courses totaling 12 credit hours. Humanities coursework is available in the following areas: American Studies, Communication and Media Studies, English, Philosophy and Religion, World Languages and Cultures. Social Science coursework is available in the following areas: Anthropology, Business Management, Economics, Education, History, Human Development, International Studies, Political Science, Psychology, and Sociology.

Mathematics: a calculus sequence which includes exposure to multivariable calculus and a separate course in differential equations (linear algebra or matrix algebra strongly recommended)	**MAT 111. Differential Calculus** Analytic geometry, the derivative and differential, elementary functions, limits, continuity, and applications. Prerequisite: It is strongly recommended that a student should have strong algebra and trigonometry skills before taking this course. OR **MAT 106. Stretch Differential Calculus.** Analytic geometry, the derivative and differential, elementary functions, limits, continuity, and applications. This course is part 1 (of 2) of a yearlong sequence in differential calculus. At the end of this two-course sequence, students will tackle all the topics above included in differential calculus. Completion of this yearlong sequence is equivalent to completion of MAT 111: Differential Calculus. Please note, Pre-Calculus placement score must be less than 50 to take this course. Also note, MAT 106 and MAT 107 can be counted as a two-course quantitative sequence for distribution, but MAT 106 and 107 do not count as a quantitative course otherwise. AND **MAT 107. Stretch Differential Calculus.** This course is the second semester of a year-long sequence in Differential Calculus. Topics in this course include trigonometry, derivatives of trigonometric functions, conic sections, implicit differentiation, and limits at infinity. The semester will conclude with the Fundamental Theorem of Calculus. Throughout the semester, students will work on a project involving Calculus, culminating in a final paper and a presentation. Completion of this year-long sequence is equivalent to completion of MAT 111. **MAT 112. Integral Calculus.** The indefinite integral, the definite integral, the fundamental theorem of the integral calculus, sequences, series, and applications. Prerequisite: MAT 111 or MAT 106-107 or permission of the instructor. **MAT 210. Multivariable Calculus.** Vectors, partial derivatives, and multiple integrals for functions of several variables. Line and surface integrals. Prerequisite: MAT 112 or permission of the instructor. **MAT 280. Linear Algebra.** An introduction to linear algebra balancing computation and the reading, understanding, and writing of mathematical proofs. A selection of topics from systems of linear equations, matrices, vector spaces, bases, dimension, linear transformations, determinants, eigenvalues, change of basis, matrix representations of linear transformations, matrix decompositions, and applications of linear algebra. It is recommended that students take MAT 240 before this course. Prerequisite: MAT 112 or permission of the instructor. **MAT 310. Differential Equations.** Elementary methods for the solution of ordinary differential equations, including the expansion of the solution in an infinite series. Prerequisite: MAT 210 or permission of the instructor.
Physics: one-year calculus-based sequence with lab	**PHY 111. General Physics I.** A calculus-based introduction to physics for further study in the physical sciences and engineering. Mechanics: kinematics and dynamics of particles, conservation laws, the law of universal gravitation, oscillations, and fluids. Thermodynamics: internal energy, heat, work, entropy, and their statistical foundations. One three-hour laboratory session per week. Co-requisite: MAT 111, or permission of the instructor. **PHY 112. General Physics II.** Second part of two-semester calculus-based introduction to physics. Waves: wave propagation, superposition, interference, and physical and ray optics. Electric and magnetic fields: Coulomb's law, Gauss's law, electric potential, steady currents, magnetic forces, Ampere's and Faraday's laws. One three-hour laboratory session per week. Prerequisite: PHY 111, co-requisite: MAT 112, or permission of the instructor.

Discipline-specific requirement for Biomedical Engineering: one semester of biology that covers cellular, molecular and developmental biology and a second semester of general chemistry with lab	**BIO 111. General Biology I.** This course provides an introduction to living systems. Topics studied include biomolecules, cell structure and function, metabolism, genetics and molecular biology. The laboratory complements the lecture and also provides an introduction to experimentation and communication of experimental results. These courses are designed for students with a strong interest in the biological sciences. **CHE 140. Reactions of Organic Molecules**. CHE 140 builds upon the fundamental principles discussed in CHE 120. Chemical Principles of Organic Molecules. This course will focus on the reactivity of organic molecules, including aliphatic and aromatic hydrocarbons, their halogenated derivatives, and molecules containing heteroatoms such as oxygen, nitrogen, and sulfur, alone or those incorporated in biologically relevant molecules. Particular emphasis is placed on the structure and function of organic molecules important in biological systems as well as the discussion of reaction mechanisms. Students will also be exposed to chemical synthesis and the use of modern spectroscopic techniques for the determination of molecular structure. This course will meet for three hours of lecture and three hours of lab per week. Prerequisites. Chemistry 120. OR **CHE 220. Quantitative Chemical Analysis.** This one-semester course is intended to provide an introduction to analytical methods utilized in chemistry. Both classical and instrumental methods of analysis are considered. A detailed treatment of simple and complex chemical equilibria with particular emphasis on acid-base, oxidation-reduction, and precipitation equilibria is presented as a basis for the classical gravimetric and titrimetric methods. The instrumental techniques include electroanalytical, UV-visible molecular spectroscopy, atomic spectroscopy, and chromatography. Other topics include a review of intermolecular forces and states of matter. Three hours of lecture and three hours of laboratory work each week. Offered every semester. Prerequisite: Chemistry 120.
Discipline specific requirement for Chemical Engineering & Environmental Engineering: one semester of biology that covers cellular, molecular and developmental biology, a second semester of general chemistry with lab, and one semester of organic chemistry with lab (a second semester of organic chemistry, physical chemistry, and a course on energy and environment from a scientific point of view are strongly recommended)	See Biomedical engineering above. **CHE 340. Synthesis of Organic Molecules**. Organic Mechanisms and Synthesis delves deeper into the concepts from Reactions of Organic Molecules (CHE 140). In this course, students will learn about modern organic reactions, their mechanisms, and the application of these reactions in organic synthesis. Students will also be exposed to polymer and supramolecular chemistry, with a focus on the synthesis and properties of these compounds and their applications. The laboratory component of this course will provide students the opportunity to learn techniques that are required for the synthesis and characterization of organic, inorganic, and organometallic compounds, as well as teach students how to think strategically about the chemical reactions needed to complete a chemical synthesis. This course will meet for three hours of lecture and three hours of lab per week. Prerequisite. Chemistry 140. Co-requisite: Chemistry 220. **ENV 314. Energy and the Environment.** This course explores general topics of energy generation, distribution, and use, as well as the many ways that the energy industry affects the environment. Topics include fossil fuels, heat engines, renewable energy sources, global effects of energy use, politics and energy policy, nuclear energy, and energy conservation. Prerequisite: ENV 101.
Discipline Specific Requirement for Computer Science & Computer Engineering: a second computer programming course Note: Computer Science and Data Science majors only are not required to complete chemistry or differential equations.	**CSI 202. Computer Science II.** The objectives of this course are twofold: (a) to study data structures, such as stacks, queues, trees, dictionaries, tables, and graphs, their efficiency, and their use in solving computational problems; and (b) to gain proficiency in an object-oriented programming language. Exercises in that language will provide an opportunity to design and implement the data structures. Prerequisite: Computer Science 201.