

**MSES prerequisites – what they are and how to fulfill them**

This document describes the MSES prerequisites for chemistry and calculus. If your admissions letter indicates that you need to satisfy a prerequisite requirement, this document will help you to satisfy them.

The MSES prerequisites for calculus include differential and integral calculus (often one semester, but sometimes two) and one semester of general chemistry with an **in-person** lab. Grades of C or better are required. Details on required course content are shown below.

If you had calculus and chemistry with a lab during undergraduate coursework at a different university, you can check to see if your courses fulfill prerequisite requirements using the IU Credit Transfer Service at <http://cts.admissions.indiana.edu/index.cfm>. If your courses are not listed on the Transfer Service, and you believe your courses satisfy a prerequisite, please email oneillad@indiana.edu and include course materials such as a syllabus or course description. Please also email these materials if your admission letter indicates a need to satisfy a prerequisite requirement and you wish to appeal that finding.

If you had AP calculus or chemistry, and took the relevant AP exams, you will need scores of 4 or 5 on the AP Chemistry and Calculus exams to satisfy the MSES prerequisites. We will request a copy your AP exam score report for any score you use to meet prerequisites. If you have a lower score, you will need to take the classes described below, even if your undergraduate institution accepted the lower score(s). For the chemistry prerequisite, an AP exam score of 4 or 5 will satisfy the lecture component of the prerequisite, but you will probably still need to take an undergraduate chemistry lab. Chemistry lab requirements will be determined on a case-by-case basis.

If you need to catch up on calculus and/or chemistry, try to complete your prerequisite course(s) *prior* to beginning master's coursework at O'Neill at a university or community college near you. It is possible to complete your prerequisites during your time at O'Neill, but if you need to complete two prerequisite courses, you will likely need to add a semester to your time to degree completion. You might be able to graduate in the usual time if you take one prerequisite course here; talk with an academic advisor about what is possible with your particular study plans.

Chemistry: Complete a first-semester general chemistry course designed for science students that includes an **in-person** lab. The table below shows the IU chemistry courses that qualify and their equivalent courses at Ivy Tech Community College.

Indiana University course numbers	Ivy Tech course numbers
Chem-C 101 and Chem-C 121	Chem 101 (includes lab. online lab not accepted)
Chem-C 103 (includes lab)	Chem 103 (includes lab. online lab not accepted)
Chem-C 105 and Chem-C 125 (rarely offered)	Chem 105 (includes lab. online lab not accepted)
Chem-C 117 and Chem-C 127	no equivalent.

Note that although Ivy Tech's Chem 111 is equivalent to IU's C101, it lacks a lab and does not satisfy the prerequisite.

Students can take an online chemistry lecture class and then a separate in-person lab if that is convenient, so long as the online lecture class covers adequate material (see "at a minimum" on the next page). If you have difficulty registering for just a lab course at IU, Professor Meretsky can help.

C101/C121 and C103 provide the minimum preparation for the MSES. For students interested in pursuing the Environmental Chemistry, Toxicology & Risk Assessment concentration, Ivy Tech's C105 or IU's C117/C127 are strongly recommended. They are also recommended for students comfortable with high-school chemistry who want better depth in their chemistry preparation, regardless of concentration plans.

For those without an AP test score in Chemistry, admission to IU's C117 and C127 will require successful completion of the ALEKS tutorial with a 95% overall mastery score (<https://www.chem.indiana.edu/undergraduate/c117-eligibility/aleks-review/>). In addition, successful completion of the ALEKS tutorial or a score of 15 on the Chemistry Placement Exam will be considered as the equivalent of C103 but students who choose to meet the chemistry prerequisite with an ALEKS score will still need to complete a lab course.

At a minimum, your chemistry course should contain:

- Units of measure, unit analysis and conversion
- Modern atomic theory (incl. particle/wave duality of light, atomic structure, atomic/molecular orbitals)
- Periodic table/chemical periodicity (incl. electronegativity)
- Chemical bonding and nomenclature (covalent and ionic bonds, multiple bonds, geometry of molecules)
- Chemical reactions: stoichiometry, types of basic chemical reactions
- Ideal gas law and its applications
- Chemical equilibria and their quantitative treatment
- Acids and bases: their reactions and quantitative treatment
- **An in-person lab component**

For more complete training (particularly for ECTRA concentration), courses should also contain

- Basic thermodynamics (enthalpy, entropy, free energy, and applications)
- Chemical kinetics (rates of reactions, rate laws, and reaction order)
- Redox reactions (balancing and evaluating thermodynamics)

Calculus: Complete M119 or M211 at Indiana University (Math 201 or 211 at Ivy Tech Community College) or an equivalent course before the first semester.

At a minimum, your calculus course should contain:

- Limits
- Continuity of functions
- Derivatives of functions of one variable
- Definite and indefinite integrals of functions of one variable
- Elementary applications of derivatives and integrals

IU's M119 (Ivy Tech's Math 201) provides less intensive training than IU's M211 (Ivy Tech's Math 211). Both satisfy the prerequisite, but those interested in developing analytical and quantitative strength should take the M211 course.

Note for students who have O’Neill fellowships and are enrolling in calculus or chemistry prerequisite courses outside of the O’Neill School, during a spring or fall semester. Typically, O’Neill fellowships require full-time enrollment (8 credits/semester for graduate students) and cover only courses within O’Neill. For students making up calculus and chemistry prerequisites outside of O’Neill, O’Neill fellowships can still be applied to support only the O’Neill credit hours that students take in that semester, even if O’Neill enrollment is less than full-time due to taking prerequisite courses through a community college or another IU department. Please talk to the financial aid staff in the Master’s Programs Office if you need further information.

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