CHEMICAL AND BIOMOLECULAR ENGINEERING, MASTER OF CHEMICAL AND BIOMOLECULAR ENGINEERING

A focus area is not required for this program.

Admission Requirements

Applicants (degree seeking and special student) must meet the general requirements for admission to graduate study, as outlined in the Admission Requirements (https://e-catalogue.jhu.edu/engineering/engineering-professionals/admission-requirements/) section. The applicant's prior education must include the following prerequisites:

1. a bachelor's degree in chemical engineering, or a closely related technical or scientific discipline;
2. mathematics through differential and integral calculus and differential equations; and
3. coursework or proficiency in chemical kinetics, transport phenomena, and thermodynamics.

Applicants whose prior education does not include the prerequisites listed above may still enroll under provisional status, followed by full admission status once they have completed the missing prerequisites. Missing prerequisites may be completed with Johns Hopkins Engineering (all prerequisites are available) or at another regionally accredited institution. Admitted students typically have earned a grade point average of at least 3.0 on a 4.0 scale (B or above) in the latter half of their undergraduate studies. Transcripts from all college studies must be submitted. When reviewing an application, the candidate's academic and professional background will be considered.

Program Requirements

Ten courses must be completed within five years. Students may count 400-level courses toward their degree if the course is not offered at the 600-level, and if the department offering the course considers it to be graduate-level, assuming, the student has not taken an equivalent course previously. Courses offered at both the 400- and 600-levels must be taken at the higher level. At least six of the ten courses must be from the Chemical and Biomolecular Engineering program. Exceptions to this must be approved by the program chair. A course from any other program may be allowed to count as one of the six courses only if it has significant chemical and biomolecular engineering content and is consistent with the student's educational goals. Nine of the courses (including the Chemical and Biomolecular Engineering courses) must be STEM related. The tenth course may be chosen from any field of interest to the student. Focus areas are not required for this program. Only one C-range grade (C+, C, or C–) can count toward the master's degree. All other grades must be B– or above. All course selections outside of the Chemical and Biomedical Engineering program courses listed below are subject to advisor approval.

Undergraduate Courses

Code	Title	Credits
Undergraduate Courses (or approved equivalent) [1,2, & 3]		**Credits**
EN.545.203	Engineering Thermodynamics	3
EN.545.301	Kinetic Processes	3
EN.545.303	Transport Phenomena I	3
or EN.545.304	Transport Phenomena II	
EN.553.291	Linear Algebra and Differential Equations	4

1 Applicants whose prior education does not include the prerequisites listed under Admission Requirements may still be admitted under provisional status, followed by full admission once they have completed the missing prerequisites. All prerequisite courses beyond calculus are available at Johns Hopkins Engineering. These courses do not count toward the degree or certificate requirements.

2 Undergraduate courses from other engineering or science disciplines may be substituted if there is significant overlap in material. Permission to substitute or waive course requirements will be at the discretion of the program chair.

3 EN.553.xxx courses are offered through the full-time Department of Applied Mathematics & Statistics.

Core Courses

Code	Title	Credits
Recommended Core Courses		**Credits**
EN.545.602	Metabolic Systems Biotechnology	3
EN.545.604	Transport Phenomena in Practice	3
EN.545.615	Interfacial Science with Applications to Nanoscale Systems	3
EN.545.671	Advanced Thermodynamics in Practice	3
EN.545.673	Advanced Chemical Reaction Engineering in Practice	3

A Focus Area can be selected (p. 1)

Focus Areas

Students should work with an advisor to choose an appropriate selection of courses in keeping with their desired focus area (Biotechnology or Nanotechnology) and career goals. Focus areas do not appear as official designations on a student's transcript or diploma.

Additional Representative Courses

Additional relevant courses are available from Chemical and Biomolecular Engineering and other related majors. The following are presented as aid to students in planning their class schedules. The students are encouraged to seek out other courses of relevance to the Master's degree.

Electives

Code	Title	Credits
Courses		**Credits**
AS.410.601	Biochemistry	4
AS.410.602	Molecular Biology	4
AS.410.603	Advanced Cell Biology	4
AS.410.645	Biostatistics	4
EN.545.603	Colloids and Nanoparticles	3
EN.545.606	Chemical & Biomolecular Separation	3

EN.545.614	Computational Protein Structure Prediction and Design	3
EN.545.615	Interfacial Science with Applications to Nanoscale Systems	3
EN.545.619	Project in Design: Alternative Energy	3
EN.545.621	Project in Design: Pharmacodynamics	3
EN.545.622	Introduction to Polymeric Materials	3
EN.545.628	Supramolecular Materials and Nanomedicine	3
EN.545.630	Thermodynamics and Statistical Mechanics	3
EN.545.637	Application of Molecular Evolution to Biotechnology	3
EN.545.639	Advanced Topics in Pharmacokinetics and Pharmacodynamics	3
EN.545.640	Micro- and Nanotechnology	3
EN.545.652	Advanced Transport Phenomena	3
EN.545.660	Polymer Physics	3
EN.545.662	Polymer Design and Bioconjugation	3
EN.545.665	Engineering Principles of Drug Delivery	3
EN.545.668	Introduction to Nonlinear Dynamics and Chaos	3
EN.545.672	Green Engineering, Alternative Energy and CO2 Capture/Sequestration	3
EN.545.691	Chemical Engineering Modeling and Design for Graduate Students	3
EN.545.800	Independent Study	0
EN.585.708	Biomaterials	3
EN.585.709	Biomechanics of Cells and Stem Cells	3
EN.585.710	Biochemical Sensors	3