

Biochemistry and Biotechnology, MS

The Biochemistry and Biotechnology Program offers three types of Master of Science degrees.

Non-Thesis

One is a 30-credit-hour non-thesis option suitable for those with laboratory research experience or for others, such as educators, who do not require research experience.

~~The second is a 32-credit-hour Professional Science emphasis area that includes a strong business component for students who are interested in learning more about the business aspects of companies. This track may not be appropriate for students who are interested in pursuing a PhD or working primarily as laboratory scientists.~~

Thesis

The ~~third second~~ option includes laboratory-based research under the supervision of one of the program faculty members, leading to a written thesis. All students admitted to the graduate program are considered to be in the non-thesis program. They may transfer into the thesis program after they have been accepted as a thesis student by one of the faculty.

Professional Science

The third is a 32-credit-hour Professional Science emphasis area that includes a strong business component for students who are interested in learning more about the business aspects of companies. This track may not be appropriate for students who are interested in pursuing a PhD or working primarily as laboratory scientists. For more information go to the [Professional Science program page](#).

Admission Requirements

Applicants to the M.S. program must submit a completed application and personal data forms, and transcripts of all previous postsecondary academic work. Submission of Graduate Record Examination scores **and letters of recommendation**, although not required, will be considered. Admission as a regular graduate student requires graduation from an accredited college with a minimum

grade point overall and in biology and chemistry courses of 3.0 (where A=4.0). Students will generally be expected to have completed a major in biology, chemistry, biochemistry or biotechnology. In addition to the Graduate School admission requirements, applicants should have completed ~~an~~ undergraduate ~~courses~~ in biochemistry, organic chemistry, cell biology, and genetics. ~~Successful applicants will typically have completed courses in organic chemistry, cell biology, and genetics.~~ Applicants may be asked to make up any deficiencies in these areas as a condition of enrollment.

All international applicants, except those from countries where English is the primary language, must ~~take the TOEFL Ordinarily, a score of 213 on the computer-based exam (550 on the paper-based exam or 80 on the internet-based exam) or better is required~~ show English proficiency by submitting according to UMSL's International Student and Scholar Services requirements.

Degree Requirements

Both the thesis and non-thesis options require a total of 30 graduate credit hours, of which at least half must be at the 5000-level or above. A maximum of 12 ~~or 5~~ credit hours of Graduate Research (BIOL 6905 or CHEM 6905) may be applied toward ~~the 30-credit hour total for~~ the thesis option ~~or and a maximum of 5 credit hours toward the~~ non-thesis options, ~~respectively~~. Students must have a 3.0 GPA in non-research courses.

Required Courses

CHEM 4722	Advanced Biochemistry	3
CHEM 5722	Advanced Graduate Biochemistry	3
CHEM 5774	Bioinformatics	3
or BIOL 5436	Applied Bioinformatics	
BIOL 6615	Advanced Biotechnology Laboratory II	4
BIOL 6602	Advanced Molecular Biology	3
or BIOL 6608	Advanced Synthetic Biology	
or BIOL 6632	Advanced Nucleic Acid Structure and Function	

or BIOL 6642	Advanced Plant Biology and Biotechnology	
BIOL 6889	Graduate Seminar	2
Elective Courses		15
CHEM 4733	Biochemistry Laboratory	2
CHEM 4772	Physical Biochemistry	3
CHEM 5302	Foundations of Physical Chemistry	
CHEM 5772	Advanced Physical Biochemistry	
CHEM 5694	Special Topics in Organic Chemistry (when relevant)	3
CHEM 5774	Bioinformatics	
CHEM 5794	Special Topics in Biochemistry	3
CHEM 6787	Problem Seminar in Biochemistry ¹	1
CHEM 6905	Graduate Research in Chemistry	1-10
BIOL 4122	Biostatistics	
BIOL 4842	Immunobiology	3
BIOL 5012	Advanced Genetics	
BIOL 5069	Topics in Cellular and Molecular Biology ¹	1
BIOL 5099	Biology Colloquium ¹	
BIOL 5436	Applied Bioinformatics	
BIOL 6608	Advanced Synthetic Biology	
BIOL 6442	Advanced Developmental Biology	3
BIOL 6550	Advanced Bacterial Pathogenesis	3

BIOL 6602	Advanced Molecular Biology	3
BIOL 6622	Advanced Cellular Basis of Disease	3
BIOL 6632	Advanced Nucleic Acid Structure and Function	3
BIOL 6642	Advanced Plant Biology and Biotechnology	3
BIOL 6652	Advanced Virology	3
BIOL 6699	Graduate Internship in Biotechnology	1-4
BIOL 6889	Graduate Seminar (when relevant)	2
BIOL 6905	Graduate Research in Biology	1-10
BIOL 6920	Advanced Topics in Biology (when relevant)	2-5
Total Hours		30

¹ Maximum of 3 credit hours between BIOL 5069, BIOL 5099, and CHEM 6787.

Sign-offs from other departments affected by this proposal

Department	Contact Person	Phone #	Objections
S002850	Wendy Olivas	x4241	No
S003000	Keith Stine	x5436	No

Rationale These updates reflect changes to the course offerings from the home departments (Biology and Chemistry&Biochemistry). In addition, options for core and elective courses have been increased to maximize timely degree progress.