BIOCHEMISTRY AND MOLECULAR BIOLOGY, M.S. OR PH.D.

About the Department

The Department of Biochemistry & Molecular Biology offers programs leading to the MS, PhD or MD/PhD degrees. These are research-based programs that provide outstanding interdisciplinary education and research opportunities.

Our 24 Primary Faculty and Adjunct Faculty have well-funded programs studying the molecular basis of genetic, bacterial, viral and parasitic diseases in projects that include control of gene expression, DNA replication and rearrangement, cell migration, signaling mechanisms, membrane biology and membrane trafficking pathways, structural biology and assembly of macromolecular complexes, and glycobiology.

The campus is well-equipped with Core Facilities (http://basicsciences.ouhsc.edu/biochemmolbiol/DepartmentFacilities.aspx) to assist high-technology research, and all departments as well as Oklahoma Medical Research Foundation (http://www.omrf.org/) have active seminar programs. Seminars (http://basicsciences.ouhsc.edu/biochemmolbiol/SeminarsEvents.aspx) allow students the opportunity to meet distinguished visiting scientists from academic, technological and government institutions all over the country as well as international speakers.

Academic Programs

MS Program

Our Master of Science program is designed to qualify graduates for jobs as lab managers or research managers in academic research or biotechnology companies. The program is very flexible and course work is determined by the student's previous experience and career aspirations. The program is thesis-driven, with emphasis on research experimental planning and interpretation of results.

PhD Program

Our research-intensive PhD program is designed to prepare students for successful careers as scientists in many occupations, such as academic research (in universities, research institutes or government laboratories), biotechnology and pharmaceutical industries, teaching, health and biomedical science management, regulatory organizations and science policy. The Biochemistry & Molecular Biology faculty is augmented by adjunct faculty at the Oklahoma Medical Research Foundation (OMRF), a private research institution across the street from our campus. Students can carry out their research on campus or at OMRF.

Most students enter the Biochemistry PhD program through the interdisciplinary Graduate Program in Biomedical Sciences (GPIBS) (http://graduate.ouhsc.edu/GraduatePrograms/PhDPrograms/GraduatePrograminBiomedicalSciences.aspx).

Students who wish to enter the Biochemistry & Molecular Biology Program directly can apply through the Admissions and Records (http://admissions.ouhsc.edu/ProspectiveStudents.aspx) web page.

Our PhD program is structured so that almost all coursework is completed in the first 1 1/2 years. In the first-year students rotate through three or more research labs to find a good match for their dissertation research. The qualifying examination is completed in the Spring of the second year, and consists of writing and orally defending a research proposal based on the proposed dissertation project. After that, the student engages almost full time in research, honing presentation skills in Journal Clubs and the departmental Workshops, and attending seminars. Students can also present their research at the annual campus Graduate Research and Technology Symposium in which they can win travel grants to attend and present research at national meetings.

Areas of Specialization

Specific areas include studying the molecular basis of genetic, bacterial, viral and parasitic diseases in projects that include control of gene expression, DNA replication and rearrangement, cell migration, signaling mechanisms, membrane biology and membrane trafficking pathways, structural biology and assembly of macromolecular complexes, and glycobiology.

Career Opportunities

The MS program of the department of Biochemistry & Molecular Biology has been recently redesigned to provide enhanced education opportunities for students who wish to extend their knowledge, experience, and opportunities for advancement in research laboratories at universities, research institutes or biotechnology companies.

Our research-intensive PhD program prepares students for successful careers as independent scientists and team leaders in academic research, biotechnology and pharmaceutical industries, health and biomedical science management or teaching.

Cost

It is the student's responsibility to ensure they are enrolled in the prescribed courses and to pay tuition and fees at the time designated by the Bursar's Office. Details regarding tuition/fee charges and collection are available from the Bursar's Office.

Prerequisites

- Bachelor's degree in a relevant major
- Grade point average of 3.0 in the last 60 hours of coursework applied to degree
- GRE general exam is required
- Proof of language proficiency for international applicants
- 3 letters of recommendation

Recommended Coursework

- Biochemistry
- Organic chemistry
- Upper division biology (one or more of the following):
  - Cell biology
  - Molecular biology
  - Microbiology
  - Physiology
- Calculus
- Physics

Master of Science Degree Requirements

Students complete at least 30 credit hours of study; 24 credit hours of coursework and at least 6 credit hours of research, under the direction of a faculty mentor, culminating in writing and defending a thesis.

The coursework includes a core biochemistry course, a course on techniques, instrumentation and experimental design, at least one advanced level course, a Current Issues course covering scientific ethics, report writing, regulatory issues, etc, and Journal Clubs. Students obtain practical experience in laboratory modules (5–8 weeks each) that will cover at least 5 different areas important in current biomedical research, such as molecular biology and informatics, protein purification and analysis, protein expression, immunology, cell culture and eukaryotic gene expression, and quantitative analysis. More specialized elective rotation topics include glycobiology, cell biology and virology, and biophysical methods such as mass spectrometry, calorimetry, Biacore, fluorescence spectroscopy and X-ray diffraction.

There is flexibility in the program to meet students' interests and aims, and the program for each student will be determined by the Advisory Committee in consultation with the student and mentor.

Fall year 1

Code	Title	Hours
BIOC 5104	Biochemistry	4
BIOC 5224	Principles of Biochemistry and Molecular Biology Laboratory Methods	4
BIOC 6220	Advanced Biochemistry Laboratory	1-4
BMSC 5001	Integrity in Scientific Research	1
BIOC 6221	Journal Club in Biochemistry and Molecular Biology	1
BIOC 5970	Graduate Student Seminar	1-6

Spring year 1

Code	Title	Hours
BIOC 6220	Advanced Biochemistry Laboratory	1-4
BIOC 6221	Journal Club in Biochemistry and Molecular Biology	1
BIOC 5970	Graduate Student Seminar	1-6
Elective		3

Summer Year 1

Code	Title	Hours
BIOC 5980	Research Master's Thesis	3

Fall year 2

Code	Title	Hours
BIOC 6220	Advanced Biochemistry Laboratory	1-4
BIOC 6221	Journal Club in Biochemistry and Molecular Biology	1
BIOC 5970	Graduate Student Seminar	1-6
BMSC 5001	Integrity in Scientific Research	1
Elective (if needed)		2-4

Spring year 2

Code	Title	Hours
BIOC 5980	Research Master's Thesis	2-6
BIOC 6221	Journal Club in Biochemistry and Molecular Biology	1
BIOC 5970	Graduate Student Seminar	1-6
Elective (if needed)		2-4

Doctor of Philosophy Degree Requirements

PhD students enroll in the common first-year Graduate Program in Biomedical Sciences (GPiBS) curriculum, which includes courses covering molecular, cellular, and systemic biology. Students complete three laboratory rotations with any of the Biochemistry & Molecular Biology mentoring faculty and participate in journal club and seminars. Students successfully completing the GPiBs curriculum and choosing a faculty mentor affiliated with Biochemistry & Molecular Biology will complete their research dissertation in the Biochemistry & Molecular Biology program. Students in the MD/PhD program are also admitted directly into the second year.

A candidate for the PhD degree must complete at least 90 credit hours of academic work, including the first year GPiBS courses. In the fall semester of the second year, Biochemistry & Molecular Biology students enroll in an advanced course on structure and dynamics of macromolecules. Six credit hours of advanced elective courses are also required. All graduate students enroll in Journal Clubs each Fall and Spring semester and participate in all departmental seminars. The remaining hours are Dissertation Research.

The successful completion of a qualifying examination is required for admission to candidacy for the Doctor of Philosophy degree. It is taken after the student's satisfactory completion of the Core Curriculum, in the Spring of the second year. The exam format is for the student to write and orally defend a research proposal. The topic is chosen by the student and is separate from the student's dissertation research. We view this exercise as a learning tool as well as an examination, and considerable guidance and feedback is given to students on how to prepare a focused, cohesive research proposal. The Graduate College rules for this examination are described elsewhere in this Bulletin, and details of the format are described in the Biochemistry & Molecular Biology handbook.

After passing the general examination the student is admitted to candidacy for the doctoral degree by the Dean of the Graduate College. The student then prepares a prospectus consisting of a description of the research problem, stating overall goals and specific aims, a survey of the relevant literature, and a specific outline of the research plan. The prospectus should be completed and approved by the Doctoral Committee by fall of the third year. A dissertation must be presented and successfully defended. For further information consult the Doctoral section of this bulletin or the Biochemistry and Molecular Biology handbook.

Fall year 1

Code	Title	Hours
BMSC 6012	Molecular Systems I	2
BMSC 6112	Molecular Systems II	2
BMSC 6152	Cellular Systems I	2

BMSC 6052	Cellular Systems II	2
BMSC 5001	Integrity in Scientific Research	1
BMSC 5021	Methods in Biomedical Research	1
BMSC 5031	Laboratory Animal Use and Concepts	1
BMSC 5221	Interdisciplinary First Year Journal Club	1
BIOC 5970	Graduate Student Seminar	1-6
BMSC 6100	Bioscience Interdisciplinary Laboratory Rotation	1-4
or BIOC 6220	Advanced Biochemistry Laboratory	

Spring year 1

Code	Title	Hours
BMSC 6100	Bioscience Interdisciplinary Laboratory Rotation	1-4
or BIOC 6220	Advanced Biochemistry Laboratory	
BIOC 6221	Journal Club in Biochemistry and Molecular Biology	1
BIOC 5970	Graduate Student Seminar	1-6
Electives		7

Summer year 1

Code	Title	Hours
BIOC 6960	Research Project	1-8
BMSC 5011	Experimental Design and Applied Statistics	1

Fall year 2

Code	Title	Hours
BIOC 6210	Physical Biochemistry of Macromolecules	2-4
BIOC 6221	Journal Club in Biochemistry and Molecular Biology	1
BIOC 5970	Graduate Student Seminar	1-6
BIOC 6960	Research Project	1-8

Spring year 2

Code	Title	Hours
BIOC 6221	Journal Club in Biochemistry and Molecular Biology	1
BIOC 5970	Graduate Student Seminar	1-6
BIOC 6960	Research Project	1-8
BIOC 6970	Biotechnology	2-4

Summer Year 2

Code	Title	Hours
BIOC 6960	Research Project	1-8

Fall year 3

Code	Title	Hours
BIOC 6221	Journal Club in Biochemistry and Molecular Biology	1
BIOC 5970	Graduate Student Seminar	1-6
BIOC 6960	Research Project	1-8

Spring Year 3

Code	Title	Hours
BIOC 6221	Journal Club in Biochemistry and Molecular Biology	1
BIOC 5970	Graduate Student Seminar	1-6
BIOC 6960	Research Project	1-8

Summer Year 3

Code	Title	Hours
BIOC 6960	Research Project	1-8

Fall Year 4

Code	Title	Hours
BIOC 6221	Journal Club in Biochemistry and Molecular Biology	1
BIOC 5970	Graduate Student Seminar	1-6
BIOC 6960	Research Project	1-8

Spring Year 4

Code	Title	Hours
BIOC 6221	Journal Club in Biochemistry and Molecular Biology	1
BIOC 5970	Graduate Student Seminar	1-6
BIOC 6960	Research Project	1-8

Summer YEar 4

Code	Title	Hours
BIOC 6960	Research Project	1-8

Fall Year 5

Code	Title	Hours
BMSC 6011	Integrity in Scientific Research II	1
BIOC 6221	Journal Club in Biochemistry and Molecular Biology	1
BIOC 5970	Graduate Student Seminar	1-6
BIOC 6960	Research Project	1-8

Spring Year 5 & Beyond

Student's advisory committee sets the remainder of any needed requirements to meet the 90 hours required for the degree.

Admission Requirements

A baccalaureate degree and a 3.0 grade point average are required by the Graduate College. Applicants from foreign institutions whose primary language is not English must submit TOEFL scores.

A science-based undergraduate record including courses in chemistry (general and organic), biochemistry and/or molecular biology is expected.

Applications for the PhD or MS program may be submitted on-line at: https://admissions.ouhsc.edu/

Note: When filling out the application, please use Academic Plan Code 0429R or 0429M.

In addition to the Application Form and official transcript submitted to the OUHSC Admissions Office, applicants must send the following to the Department of Biochemistry & Molecular Biology:

1. a copy of the application
2. a copy of all transcripts

3. a statement of why you wish to enter the MS program and which faculty laboratory(ies) you would like to work in
4. three letters of recommendation from people familiar with your work
5. GRE scores
6. TOEFL scores if English is not your primary language

Applicants for the PhD program of the Department of Biochemistry & Molecular Biology may also apply through the interdisciplinary Graduate Program in Biomedical Sciences (GPiBS) (http://graduate.ouhsc.edu/Programs/PhD-Programs/Graduate-Program-in-Biomedical-Sciences/Admissions/), which combines the expertise of six programs at the University of Oklahoma Health Sciences Center: Biochemistry & Molecular Biology, Cell Biology, Microbiology & Immunology, Neuroscience, Pathology, and Physiology. The application procedure is described in the GPiBS section of the Bulletin. An application is filed with the Office of Admissions and is accompanied by official transcripts and results of the Graduate Record Examination (GRE), and TOEFL for foreign applicants. Three letters of recommendation, from individuals who can address the candidate's research potential and suitability for graduate school, are also required. Successful applicants complete the multidisciplinary GPiBS (http://graduate.ouhsc.edu/Graduate-Programs/PhD-Programs/Graduate-Program-in-Biomedical-Sciences/) first year curriculum and enter the Biochemistry & Molecular Biology program in the summer of their first year.

Program Objectives

Our research-intensive PhD program is designed to prepare students for successful careers as independent scientists in academic research, biotechnology and pharmaceutical industries, health/biomedical science management or teaching.

Our recently redesigned MS program is also research-based, along with coursework designed to provide enhanced education opportunities for students who wish to extend their knowledge, experience, and opportunities for advancement in research laboratories at universities, research institutes or biotechnology companies. The curriculum, separate from that of the PhD program, emphasizes understanding of research procedures as well as development of technical and problem-solving skills.