

TEXAS TECH UNIVERISTY
HEALTH SCIENCES CENTER
Graduate School of Biomedical Sciences
M.S. Program *in* Biotechnology

**Guidelines and Requirements for Graduate Students
M.S. Program in Biotechnology**

I. Program of Study

The Master of Science (M.S.) in Biotechnology program, located on the Abilene and Lubbock campuses, offers several options for students interested in careers in biotechnology companies; technical research positions in academia, industry, or government agencies; and/or preparing for entry into a doctoral program. The program offers two tracks: (1) a one-year, non-thesis option which provides a strong foundation of knowledge about core concepts with minimal hands-on research experience; and (2) a 21-month, research track requiring two semesters of primarily didactic coursework and 12 months of full-time laboratory research.

The research track is typically a non-thesis degree with an optional thesis at the end of the second year by arrangement with the advisor. The research component may be completed either at a company in the biotechnology industry or on campus with graduate faculty members with active research programs. In Abilene, faculty members in the Department of Immunotherapeutics and Biotechnology are well-funded researchers who study cancer biology, cancer immunology and immunotherapy, nanoparticle drug delivery, tumor micro-environments, and drug screening. Biotechnology faculty members on the Lubbock campus represent faculty in the basic sciences and clinical departments. As such, they represent a variety of research interests, such as addiction, Alzheimer's disease, cancer, diabetes, neurobiology, protein biophysics, virology, and much more.

The program only admits new students in the fall term.

II. Program Details

A. Prerequisites for Admission: See the GSBS website for a complete list of admission requirements:
<https://www.ttuhsb.edu/biomedical-sciences/biotechnology/program.aspx>

1. A bachelor's degree or the equivalent from an accredited college or university.
2. The applicant's undergraduate record including grade point average (based on 4.0 system) will be considered as part of the overall application.
3. Graduate Record Examination (GRE) General Test. This is a requirement for all international applicants, but is optional for domestic applicants. The GRE is optional for international students who have earned a degree from an accredited college or university in the United States.
4. Two letters of recommendation, which must be from former faculty or administrators who are familiar with the scholastic abilities of the applicant.
5. A personal interview may be requested.

B. Program Mandates

- All students are required to take the GSBS Core I-IV curriculum courses in the fall, the Biotechnology core curriculum in the spring, all Interprofessional Education (IPE) requirements (https://www.ttuhsu.edu/interprofessional-education/core_curriculum.aspx), 6 hours of research and at least 9 months of industry internship or academic research, excluding students enrolled in the one year option.
- In the spring semester of the first year of study, students will conduct interviews with companies, regulatory agencies and faculty to determine their placement for their second-year research work in the program, as applicable.

C. Biotechnology Student Checklist – Research Track (Appendix 1)

D. Sequence of Events Upon Entering the Program

1. Introductions – All new graduate students will meet with the Biotechnology Graduate Program Advisor – Irene La-Beck (Abilene) & Komaraiah Palle (Lubbock) to plan first-year laboratory rotations and curriculum.
2. Laboratory Rotations – In the fall semester of the first-year curriculum, students take GSBS 5020: Laboratory Methods. Two lab rotations in the spring semester of the first-year curriculum are also required (GBTC 5337 – Techniques in Biotechnology Research). All new graduate students will interview with the biotechnology graduate faculty interested in having a student in their lab prior to beginning laboratory rotations. The goal of this interview is to formally introduce incoming students to program faculty members and to determine if the student has an interest in a faculty’s research. Students should ascertain the potential for laboratory rotations and the possibility of a faculty member becoming a mentor. Interviews must be documented and completed by the end of the fall term. Upon completion of the interviews, new students will submit their requests for rotations in the spring semester and confirm this plan with the Graduate Advisor. The two laboratory rotations are expected to run consecutively to fill the full spring semester. Each faculty member involved will submit a written evaluation for each rotation that must be reviewed with the student. A final rotation grade will be assigned based on the Lab Rotation Rubric. The signed form will be included in the student’s program file folder.
3. Program Curriculum
Sample Curriculum (Research Track)

YEAR 1

Prefix/Number	Course Title	SCH
Fall Term		
GSBS 5471	Core I: Molecules	4
GSBS 5372	Core II: Cells	3
GSBS 5373	Core III: Genes	3
GSBS 5174	Core IV: Biomedical Seminar	1
GBTC 5020	Laboratory Methods	2
		13
Spring Term		
GBTC 6201	Biotechnology Seminar	2
GBTC 5337	Techniques in Biotechnology Research	3
GBTC 6301	Introduction to Biotechnology	3
GBTC 6202	Biomedical Informatics	2
GSBS 5101	Responsible Conduct of Research	1
Varies	Elective	3

14

Summer TermGBTC7000/GBTC 6001^a Research or Internship

6

YEAR 2**Prefix/Number****Course Title****SCH****Fall Term**GBTC 7000^b/GBTC 6001 Research or Internship

9

GBTC 5199 Biotechnology Lab Report OR

1

GBTC 5298 Biotechnology Industry Report

2

10 or 11

Spring TermGBTC 7000^b/GBTC 6001 Research or Internship

9

GBTC 5299 Biotechnology Final Report

2

11

PROGRAM TOTAL 54 or 55

^a To receive academic credit for GBTC 7000/GBTC 6001, students are expected to work approximately 4.5 hours per week for every 1 SCH in a 10-week semester.

^b Students who choose a TTUHSC research lab will be granted a paid Research Assistantship.

Sample Curriculum (One-Year Option)^a**YEAR 1****Prefix/Number****Course Title****SCH****Fall Term**

GSBS 5471 Core I: Molecules

4

GSBS 5372 Core II: Cells

3

GSBS 5373 Core III: Genes

3

GSBS 5174 Core IV: Biomedical Seminar

1

GBTC 5020 Laboratory Methods

2

13

Spring Term

GBTC 6201 Biotechnology Seminar

2

GBTC 5337 Techniques in Biotechnology Research

3

GBTC 6301 Introduction to Biotechnology

3

GBTC 6202 Biomedical Informatics

2

GSBS 5101 Responsible Conduct of Research

1

11

Summer TermGBTC7000/GBTC 6001^b Research or Internship

6

6

PROGRAM TOTAL 30

^a The one-year option is accepting applications starting in Fall 2023 for enrollment in Fall 2024.

^b To receive academic credit for GBTC 7000/GBTC 6001, students are expected to work approximately 4.5 hours per week for every 1 SCH in a 10-week semester. Students in the one-year program will not be granted a paid Research Assistantship at TTUHSC.

4. Major Advisor and Advisory Committee – The Biotechnology Program Directors and Graduate Advisors will serve as major advisors for the biotechnology graduate students. The Biotechnology Graduate Program Committee will serve as the Advisory Committee to oversee student performance. If a student elects to do research at a TTUHSC laboratory, the PI of that laboratory will assume the role of Major Advisor after approval from the Biotechnology Program Director. The responsibilities of the Major Advisor are to: 1) monitor the progress of the student's research, and 2) establish and maintain financial support for the student to complete his/her research project.

5. Assessment of Graduate Student Progress

The Graduate Student Checklist is the major tool for assessing graduate student progress through the degree program. It is the student's responsibility to ensure that all appropriate forms are signed and filed with the Student Affairs Advocate according to deadlines. The Assessment of Graduate Student Progress form and the student's file will be reviewed at the end of the 1st year (May) and again in April of year two by the Program Graduate Committee and summarized on the Biotechnology Student Checklist (Appendix 1), as appropriate. In addition to meeting the program requirements detailed below, it is expected that the student will maintain above average ratings in all required assessment tools. Failure to maintain these standards may result in the student being placed on academic probation or dismissed from the program.

6. Qualifying Exam – Students in the Biotechnology Program do NOT take a qualifying exam.

7. Completion of the Degree Program:

A) Thesis Option:

All didactic class work should be completed by the start of the second year for students in the research track (Appendix 1). The remainder of the student's tenure in the program is to be spent conducting, publishing and presenting their research.

Intent to Graduate – A student planning to graduate must file in the GSBS office the statement of intent to graduate at the beginning of the semester of intended graduation. Students should check the [GSBS Academic Calendar](#) for the graduation deadline dates.

Final Oral Report - Once the committee agrees that the research is complete, plans for writing and defending a student's thesis should be made. A draft of the thesis and an abstract must be submitted to the Advisory Committee at least two weeks prior to the final oral examination.

Thesis Defense – Students defend their thesis in a final public seminar followed by a private oral examination by their Advisory Committee. The written thesis must be submitted to the Advisory Committee two weeks prior to the Defense date. Evaluation of the defense and determination of its outcome is documented by the Advisory Committee and reviewed with the student. The results of the defense are recorded on the thesis oral defense form and the thesis signature form.

Thesis Copies – The GSBS requires only submission of a .pdf copy of the final version to the Student Affairs Advocate.

B) Non-Thesis Option:

All didactic class work should be completed by the start of the second year for students in the research track (Appendix 1). The remainder of the student's tenure in the program is to be spent conducting and presenting their research or internship experience.

Intent to Graduate – A student planning to graduate must file in the GSBS office the statement of intent to graduate at the beginning of the semester of intended graduation. Students should check the [GSBS Academic Calendar](#) for all graduation deadlines.

Final Written and Oral Report – While students who select the non-thesis option are not required to write and orally defend a thesis, the program does require submission of a final written report that should take the form of a peer-reviewable manuscript from a scientific journal of your choosing and which contains the applicant's research and an oral defense of this manuscript.

III. **Expectations for Continuation in the Biotechnology Program and Appeals Following Dismissal**

The Biotechnology program will follow all GSBS policies and procedures. Additional details on this policy are available in the GSBS [catalog](#).

IV. **Research Assistantships and Industry Internships – Research Track**

Students admitted into the Biotechnology program will receive scholarships in the fall semester. Beginning in the summer term, if a student chooses to stay in a Biotechnology faculty lab, research assistantships will be available (½ paid by GSBS, ½ paid by investigator) through the completion of the program (given that students are in good academic and professional standing). The RA salary is \$25,000.

Students choosing to pursue an industry internship will be responsible for securing the internship. Those students who take the industry route will have their scholarship renewed for the second year (given the student is in good academic and professional standing.) Internships should start in the summer semester, and students are not eligible for fee waivers.

More information on internships is provided on the GSBS Biotechnology [website](#). Students will meet with their Graduate Advisor and Student Affairs Advocate in November of each year before Thanksgiving. A checklist will be started and electives explained and rotations discussed for the spring. Students are expected to join the monthly Biotech Connect zoom meetings, which meet the first Wednesday of the month.

APPENDIX 1: Biotechnology Student Checklist Research Track

Degree Plan Checklist Worksheet		
Fall Year 1	Status	13 hours
GSBS 5000 Interprofessional Collab Practice		
GSBS 5471 Core I: Molecules		
GSBS 5372 Core II: Cells		
GSBS 5373 Core III: Genes		
GSBS 5174 Core IV: Seminar		
GBTC 5020 (2) Biotech Lab Methods		
Spring Year 1	Status	11 hours
GBTC 6201 Biotech Seminar		
GBTC 6202 Biomedical Informatics		
GBTC 6301 Intro to Biotechnology		
GBTC 5337 Techniques in Biotech		
GSBS 5101 Responsible Conduct of Research		
Summer Year 1		6 hours
Lab Option		
GBTC 7000 (6) Research		
Industry Option		
GBTC 6001 (6) Industry Internship		
Fall Year 2	Status	10-11 hours
Lab Option		
GBTC 7000 (9) Research		
GBTC 5199 Biotech Lab Report		
Industry Option		
GBTC 6001 (9) Research		
GBTC 5298 Biotech Industry Report		
Spring Year 2	Status	11 hours
Lab Option		
GBTC 7000 (9) Research		
GBTC 5299 Biotech Final Report		
Industry Option		
GBTC 6001 (9) Biotech Internship		
GBTC 5299 Biotech Final Report		
Elective Choice: Must take a total of 3 hours of electives to meet program requirements		
GBTC 5210 The Microbiome		3 hours
GBTC 5212 Intro to Bacteriology		
GBTC 5213 Intro to Virology/Parasitology		
GBTC 5340 Biology of Cancer		
Other concentration advanced courses: GBCM 6320 Advanced Cell Biology, GBCM 6333 Advanced Protein Biochemistry, GMBP 5302 Human Physiology, GTNP 5303 Principles of Translational Neuroscience and Pharmacology, GMBP 5321 Biochemistry & Biophysics of Membranes		
Institutional Requirements	Status	1 Activity
InterProfessional Education (IPE) Activity		