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 program in Biotechnology offers a Master of Science degree. At the time of admission into the Biotechnology program, all students are subject to the requirements listed in the Texas Tech University Health Sciences Center Student Handbook (Code of Professional and Academic Conduct), the Graduate School of Biomedical Sciences Catalog, as well as the guidelines given below.

The program only admits new students in the Fall term.

II. MS Program

A. Prerequisites for Admission: See the GSBS website for a complete list of admission requirements: www.ttuhsc.edu/gsbs

1. A bachelor's degree or the equivalent from an accredited college or university.
2. The applicants' undergraduate record including grade point average (based on 4.0 system) will be considered as part of the overall application.
3. Each student must take the Graduate Record Examination (General Test).
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 1-4 curriculum courses in the Fall, the Biotechnology core curriculum in the Spring, all GSBS IPE requirements (https://www.ttuhsc.edu/interprofessional-education/core_curriculum.aspx), 6 hours of research and at least 9 months of internship.
- In the Spring semester of the first year of study, students will conduct interviews with companies, regulatory agencies and faculty to determine where students will intern for the second year of the program.

C. Graduate Student Checklist (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) & Ina Urbatsch (Lubbock) (Appendix 2) to chart out 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 (GSBS 5350 - Laboratory Methods in Biomedical Sciences). 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 (Appendix 3). Interviews must be documented and completed by the end of the 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 (Appendix 4). The two laboratory rotations is 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 (Appendix 5). The signed form will be included in the student's program file folder.

3. Program Curriculum

FIRST YEAR CURRICULUM

FALL SEMESTER: All new biotechnology students are required to take core courses I-V.

GSBS 5471 — CORE I: MOLECULES – This course offers a broad coverage of biochemistry with an emphasis on structure and function of macromolecules, biosynthesis of small molecule precursors of macromolecules, and the pathways of intermediary metabolism.

GSBS 5372 — CORE II: CELLS – The structure/function relationships that underlie basic cellular processes, including translation protein trafficking, cytoskeletal organization and motility, cell adhesion, and cell division.

GSBS 5373 — CORE III: GENES – Teaches essential scientific concepts underlying the field of Molecular biology and Molecular Genetics.

GSBS 5174 – CORE IV: BIOMEDICAL SEMINAR – Students will attend and participate in seminars.

GBTC 5020 — LABORATORY METHODS- Students learn laboratory skills and procedures

SPRING SEMESTER:

1. **GBTC 6101 BIOTECHNOLOGY SEMINAR**- Students are required to attend all seminars sponsored by the Biotechnology Program. Students will present a seminar in their first year and a final seminar at the end of their internship (Spring semester) of the second year. Deviation from the yearly seminar

presentation requirement requires approval of the Biotechnology graduate program committee.

2. **GBTC 6301 INTRODUCTION TO BIOTECHNOLOGY** – Broad coverage of topics with high current interest and utility to the medical and agricultural biotechnology industries. Emphasizes application of technologies.

3. **GBTC 6202 BIOMEDICAL INFORMATICS**- Provides a broad introduction to the field of bioinformatics in medical research. Emphasizes use of modern software packages and internet-based genomic and other databases to solve research problems. *Personal laptop required – must meet the School of Medicine laptop specifications.*

4. **GSBS 5101 RESPONSIBLE CONDUCT OF RESEARCH** – Addresses the regulatory and ethical environment of today's biomedical research as well as such topics as authorship and data management.

5. **GBTC 5337 TECHNIQUES IN BIOTECHNOLOGY RESEARCH –** Through rotations in the laboratories of Biotechnology graduate concentration faculty members, standard experimental techniques used in Biotechnology are explored through a series of hands-on laboratory exercises. The objective of lab rotations are two-fold: (1) allows the student to choose a faculty member in which to conduct his/her master's research; (2) allows the student to learn multiple experimental techniques and approaches.

6. ELECTIVE (3 HOURS)

SUMMER SEMESTER:

1. **GBTC 7000 (6 hours) RESEARCH** or
   GBTC 6001 (6 hours) BIOTECHNOLOGY INTERNSHIP

2. **Elective (optional) (3 hours)-** (i.e. Business course, Intellectual Property law course, etc.)

   - Executive MBA
   - OR Mini-laboratory internship (academic or corporate)
   - OR Begin 12 month internship (academic or corporate)

SECOND YEAR CURRICULUM

Year 2 Internship:

FALL SEMESTER (INDUSTRY OPTION)

1. **GBTC 6001 (9 hours) BIOTECHNOLOGY INTERNSHIP**
2. **GBTC 5298 BIOTECHNOLOGY INDUSTRY REPORT**

SPRING SEMESTER (INDUSTRY OPTION)

1. **GBTC 6001 (9 hours) BIOTECHNOLOGY INTERNSHIP**
2. **GBTC 5299 BIOTECHNOLOGY FINAL REPORT**

FALL SEMESTER (LAB OPTION)

1. **GBTC 7000 (9) RESEARCH**
2. **GBTC 5199 BIOTECHNOLOGY LAB REPORT**
3. **Elective (Optional)**

SPRING SEMESTER (LAB OPTION)

1. **GBTC 7000 (9) RESEARCH**
2. **GBTC 5299 BIOTECHNOLOGY FINAL REPORT**
3. **Elective (Optional)**

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 (Appendix 1):

   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 Graduate Program Coordinator 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 Annual Graduate Student Progress Review form (Appendix 6). 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 (Appendix 1). 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:

   GSBS requires a minimum of 36 hours of graduate course work, which must include 6 hours of research plus 6 hours of thesis.

   All didactic class work should be completed by the start of the second year (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 website at: http://www.ttuhsc.edu/gsbs/current/ for the graduation deadline dates.

Final Oral Report - Once the committee agrees that the research is complete plans, for the writing and defending a student's thesis should be made (Appendix 7). 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 Bound Copies – Students are required to purchase one bound copy through a bindery (GSBS recommends using thesisondemand.com). Student advisory committee members may also request that the student provide them with a bound copy. The program requires only submission of a .pdf copy of the final version to the graduate program coordinator.

B) Non-Thesis Option:

GSBS requires a minimum of 36 hours of graduate course work, and must include 6 hours of research.

All didactic class work should be completed by the start of the second year (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 website for graduation deadlines at: http://www.ttuhsc.edu/gsbs/current/.

Final Written and Oral Report: While students that select the Non-Thesis Option are not required to write and orally defend a MS 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 a 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 the following are available in the GSBS catalog: http://www.ttuhsc.edu/gsbs/

A. Continuation in the Program

Every student enrolled is required to maintain a high level of performance and to comply fully with policies of TTUHSC, GSBS and the Biotechnology Program. The Graduate School of Biomedical Sciences reserves the right to place on probation or to dismiss any graduate student who does not maintain satisfactory academic standing or who fails to conform to the regulations. Students who are conditionally admitted to a degree program are automatically on probation. Failure to fulfill the conditions stipulated at the time of admission will result in dismissal from the program.

Every student is expected to maintain a high level of commitment to professional development in a variety of areas. If any aspect of a student's professional development (for example attention to teaching responsibilities, appropriate growth toward development of critical thinking skills or appropriate progress toward research goals, etc.) is considered to be unsatisfactory by the Biotechnology Program Graduate Committee, the student shall be so informed in writing, along with a description of the recommended corrective action and the period of time allowed for the corrective action to be taken. If the student fails to correct the deficiency, the committee may recommend dismissal of the student from the program.

If a student's graduate GPA for a particular semester falls below 3.0, the student will be placed on academic probation. The student must make a 3.0 GPA or better in the next semester in which he or she is enrolled. Failure to do so, or to maintain a 3.0 current GPA in each succeeding semester, may result in academic dismissal from GSBS. Regulations governing scholastic probation are based on semester grade-point averages and will be applied regardless of overall grade-point average.

B. Appeals and Grievance Process

Student Appeals Policy. This policy applies to specific grievances arising from matters affecting students' academic standing and performance, such as disputes concerning comprehensive examinations and graduate assistantships. Appeals may be made only when alleged prejudicial, arbitrary or capricious action is involved. The burden of proof of unfair influence or action rests with the student.

A student wishing to appeal a decision or action first should discuss the matter with the faculty member or members involved. If the student is not satisfied with the outcome of this effort, the student should contact the Program Director. This contact, like that with the faculty members, normally is informal, and the Program Director may take whatever action he or she deems advisable in attempting to resolve the issue. All parties involved should make every effort to resolve the issue without going beyond this level. The Program Director may consult with either the Biotechnology Program Graduate Committee or an *ad hoc* committee of graduate faculty from the Program (when the appeal is of an action taken by the Graduate Committee or a substantial proportion of its elected members) for advice regarding his actions in an appeal. If the student still is not satisfied following these meetings and discussions, the student may make a formal appeal to the Dean for the Graduate School of Biomedical Sciences. The appeal shall be processed according to the rules of the Graduate School in effect at the time it is filed with the GSBS Dean.

IV. Research Assistantships

Students admitted into the Biotechnology program will receive scholarships in the Fall and Spring 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 standing).

APPENDIX 1: Student Checklist

Biotechnology
Student Checklist

Requirements	Date Completed	Grade
Required Courses		
GSBS 5471 CORE I: Molecules		
GSBS 5372 CORE II: Cells		
GSBS 5373 CORE III: Genes		
GSBS 5174 CORE IV: Biomedical Seminar Series		
GBTC 5020 Laboratory Methods		
GBTC 6301 Introduction to Biotechnology		
GBTC 6101 Seminar		
GBTC 6202 Biomedical Informatics		
GSBS 5101 Responsible Conduct of Research		
GBTC 5337 Techniques in Biotechnology Research		
Elective:_____		
Year 2, GBTC 5199 or GBTC 5298 (Fall)		
Year 2, GBTC 5299 (Spring) (final presentation)		
GBTC 7000 Research or GBTC 6001 Internship (24 hours)		
Interviews with companies, agencies and faculty completed no later than May of the first year.		
Internship Selection following interviews.		
Submit Degree Program to GSBS during Spring semester of first year.		
Submit Intent to Graduate to GSBS		
See checklist for graduation deadlines from the GSBS website.		

Appendix 2: Current Committee Assignments

Biotechnology Graduate Program Committee:

ABILENE	
Sanjay Srivastava, Ph.D.	Abilene Program Director
Irene La-Beck, Pharm.D.	Graduate Program Advisor –Abilene
Maciej Markiewski, M.D., Ph.D.	
Kimberly Sullivan	Student Affairs Advocate - Abilene
LUBBOCK	
Susan Bergeson, Ph.D.	Lubbock Program Director
Ina Urbatsch, Ph.D.	Graduate Program Advisor - Lubbock
Michael Blanton, Ph.D.	Ex-Officio
Ted Reid, Ph.D.	
Kendra Rumbaugh, Ph.D.	
Tracy Cowin, MBA	Student Affairs Advocate- Lubbock

Graduate Council Representatives:

Irene La-Beck - Abilene
Kendra Rumbaugh - Lubbock

Appendix 3
Graduate Faculty of the Biotechnology Program

ABILENE FACULTY
Sanjay Srivastava, Ph.D. (Abilene Program Director)
Irene La-Beck, Pharm.D. (Abilene Graduate Advisor)
Magdalena Karbowniczek, MD, Ph.D.
Dawn Kochaneck, Ph.D
Devin Lowe, Ph.D.
Maciej Markiewski, MD, Ph.D.
Sahdeo Prasad, Ph.D.
Dipongkor Saha, Ph.D.
Laurence Wood, Ph.D.

LUBBOCK FACULTY
Susan Bergeson, Ph.D. (Lubbock Program Director)
Ina Urbatsch, Ph.D. (Lubbock Graduate Advisor)
Sharilyn Almodovar, Ph.D.
Guillermo Altenberg, Ph.D.
Pablo Artigas, Ph.D.
Yangzom Bhutia, Ph.D.
Michael Blanton, Ph.D.
Ion Alexandru Bobulescu, M.D.
Robert Bright, Ph.D.
Gail Cornwall, Ph.D.
Jannette Dufour, Ph.D.
Stephanie Filleur, Ph.D.
Joe Fralick, Ph.D.
Vadivel Ganapathy, Ph.D.
Matthew Grisham, Ph.D.
Petar Grozdanov, Ph.D.
Lan Guan, MD, Ph.D.
Josee Guindon, Ph.D.
Abdul Hamood, Ph.D.
Daniel M. Hardy, Ph.D.
George Henderson, Ph.D.
Michaela Jansen, Ph.D.
Min Kang, Ph.D.

Andrey Karamyshev, Ph.D.
Josh Lawrence, Ph.D.
Hongjun Liang, Ph.D.
Clinton C. MacDonald, Ph.D.
Pratip Mitra, Ph.D.
Srinivas Nandana, Ph.D.
Madhusauhanan Narasimhan, Ph.D.
Volker Neugebauer, Ph.D.
Komaraiah Palle, Ph.D.
Lindsey Penrose, Ph.D.
Igor Ponomarev, Ph.D.
Samuel Prien, Ph.D.
Kevin Pruitt, Ph.D.
Hemachandra Reddy, Ph.D.
Ted Reid, Ph.D.
Patrick Reynolds, MD, Ph.D.
Kendra Rumbaugh, Ph.D.
Brandt Schneider, Ph.D.
Afzal Siddiqui, Ph.D.
Bryan Sutton, Ph.D.
Peter Syapin, Ph.D.
Jeffrey Thomas, Ph.D.
Manisha Tripathi, Ph.D.
Vijay Tonk, Ph.D.
Ina Urbatsch, Ph.D.
Simon C. Williams, Ph.D.

Appendix 4: Laboratory Rotation Schedule

To: The Graduate Advisor of the Biotechnology Program

From: Graduate Student _____

Subject: Schedule for laboratory rotations

Date: _____

Faculty Member	Time Period (8-12 weeks)	Purpose of Rotation: Potential Experience	Purpose of Rotation: Research Experience
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____

The faculty member must agree upon rotation choices.

Date Reviewed by Graduate Program Advisor: _____

Appendix 5: Evaluation of graduate students during laboratory rotations.

Biotechnology Graduate Program
Rubric for

Student Name: _____ Rotation Date: _____

Circle either YES or NO for each question. NO requires an explanation

1. Student understands the rationale of the research focus of the lab.
YES NO (explanation):

2. Student demonstrates sufficient experimental attention to detail.
YES NO (explanation):

3. Student learns the principles of methods used for experiments.
YES NO (explanation):

4. Student learns to interpret data independently and accurately.
YES NO (explanation):

5. Student demonstrates capacity to plan appropriate experiments.
YES NO (explanation):

6. Student maintains a legible record of experimental details.
YES NO (explanation):

7. Student demonstrates progressively increasing independence.
YES NO (explanation):

8. Student was in the laboratory an average of six hours per week.
YES NO (explanation):

Final Grade (circle one):

If six or more 'YES': A

If three or four 'NO': B

If five or more 'NO': C

ADDITIONAL COMMENTS: (If additional space is needed continue on the back)

Date evaluation reviewed by Graduate Advisor _____

Appendix 6: Annual Graduate Student Progress Review

Student Name: _____

Program Committee Review Date: _____

Comments: _____

_____

_____

_____

_____

Graduate Advisor Signature: _____

APPENDIX 7: Final Oral Report

This form should be completed and filed in the student's official departmental record following agreement by the student's graduate committee that all necessary "benchwork" has been completed for the thesis. Committee members are urged to strongly consider a student's track record of productivity as judged by peer-reviewed publications or presentations at meetings. No more than one negative vote can be cast in this regard. This is a major "turning point" in the students training. It signifies the time at which the student should stop doing experiments and begin writing his/her thesis. Use additional pages if necessary.

Students must submit this form to the graduate program coordinator each year in May as part of the graduate program committee student progress evaluation process. Committee signatures are not required for the yearly submission.

Date: _____

Student: _____

List of abstracts, publications, presentations, awards, and/or graduate fellowships:

_____

_____

_____

_____

_____

_____

_____

Committee Members	In favor	Against
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Reviewed by Graduate Advisor: Date: _____

Appendix 8
Required Courses

Year 1, Fall Term

Course Number	Course Name	Credit Hours
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
	Total	**13**

Year 1, Spring Term

Course Number	Course Name	Credit Hours
GBTC 6101	Biotechnology Seminar	1
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
	Elective	3
	Total	**13**

Year 1, Summer Term

Course Number	Course Name	Credit Hours
GBTC 7000 or GBTC 6001	Research or Internship	6
	Elective (Optional)	3
	Total	**9**

Year 2, Fall Term

Course Number	Course Name	Credit Hours
GBTC 7000 or GBTC 6001	Research Internship	9 9
GBTC 5199 or GBTC 5298	Biotechnology Lab Report Biotechnology Industry Report	1 2
	Total	**10 or 11**

Year 2, Spring Term

Course Number	Course Name	Credit Hours
GBTC 7000 or GBTC 6001	Research Internship	9 9
GBTC 5299	Biotechnology Industry Report	2
	Elective	
	Total	**10 or 11**