# Genomics - Bioinformatics Emphasis, MS

## Program Description

The Master of Science in Genomics is designed to support workforce readiness and academic advancement. The program provides flexible pathways, including a 5-year BS/MS option for UT undergraduates to complete both bachelor's and master's degrees in five years, as well as a two-year track for external students. With emphases in Bioinformatics and Functional Genomics, the curriculum integrates computational skills, such as genomic data analysis and machine learning, with experimental techniques, including CRISPR/Cas9 gene editing and 3D organoid modeling, ensuring students are prepared for industry roles or further graduate studies.
Grounded in active, hands-on learning, the program emphasizes lab-based and project-driven experiences that foster practical skills critical for careers in the life sciences. Cross-training in both emphases ensures a comprehensive understanding of genomics by blending computational and experimental methodologies. This proposal exemplifies UT's commitment to innovation, accessibility, and excellence in education, advancing its polytechnic mission to meet the evolving demands of the workforce.

## Admissions Requirements

1. BS from a regionally accredited institution in Biology, Biochemistry, or a closely related field, or are on track to complete a BS within the next academic year.
2. Successful completion of the following courses (or equivalent at a local institution): A. Functional Genomics Emphasis.
3. i. BIOL 3030 Principles of Genetics
   ii. BIOL 3330 Cell Biology
   iii. BIOL 4300 Molecular Bio
   iv. CHEM 3510 Biochemistry I
   B. Bioinformatics Emphasis
   i. BIOL 1610 Principles of Biology
   ii. CS 1400 Fundamentals of Programming
   iii. BIOL 3300 Intro to Bioinformatics
4. Cumulative GPA of 3.0 or higher.
5. Submit a personal statement of your career goals and why you feel this program will support your goals.
6. Submit Official transcripts
7. Submit Curriculum Vitae (CV).
8. Submit two (2) letters of support.
9. Submit a video interview discussing specific question prompts.

## Program Curriculum

### 30 Credit

| Code | Title | Hours |
|---|---|---|
| **Required College-Level Prerequisite Courses** | | |
| BIOL 1610 | Principles of Biology I (LS) | 4 |
| CS 1400 | Fundamentals of Programming | 3 |
| BIOL 3300 | Introduction to Bioinformatics | 3 |

### Program Required Courses

| Code | Title | Hours |
|---|---|---|
| BIOL 5100/6100 | Biomedical Research Ethics | 1 |
| BIOL 5330/6330 | Genomics & Precision Medicine | 3 |
| BIOL 5320/6320 | Scripting For Biologist | 3 |
| BIOL 5900R/6900R | Genomics Capstone | 1-3 |
| BIOL 5910/6910 | Genomics Seminar I | 1 |
| BIOL 5920/6920 | Genomics Seminar II | 1 |

| | | |
|---|---|---|
| BIOL 6930 | Research in Progress I | 1 |
| BIOL 6940 | Research in Progress II | 1 |

## Program Electives

| Code | Title | Hours |
|---|---|---|
| **Students must meet with their Advisor before registering for electives** | | |
| BIOL 6990R | Directed Studies | 1-3 |
| BIOL 6105R | Genomics Lab Rotation | 1-3 |

## Bioinformatics Emphasis Courses

| Code | Title | Hours |
|---|---|---|
| BIOL 5070/6070 | AI & Machine Learning in Biology | 3 |
| BIOL 6010 | Genomic Pipeline Optimization | 3 |
| BIOL 6040 & BIOL 6045 | Multi-omics Data Analysis and Multi-omics Data Analysis Lab | 4 |
| BIOL 6130 | Statistical Genomics | 3 |
| BIOL 6310 | Bioinformatic Algorithms | 3 |

# Graduation Requirements

1. Complete the required 30-32 hours of coursework.
2. Earn a 3.0 or higher GPA for the entire program.
3. Receive no less than a B- in any of the program courses.

Graduation Plan

**1st Year**

| Fall Semester | Hours | Spring Semester | Hours |
|---|---|---|---|
| BIOL 6070 | 3 | BIOL 6105R Please meet with your Advisor before registering for this class | 1 |
| BIOL 6310 | 3 | BIOL 6330 | 3 |
| BIOL 6320 | 3 | BIOL 6900R | 1 |
| BIOL 6900R | 1 | BIOL 6920 | 1 |
| BIOL 6910 | 1 | | |
| | **11** | | **6** |

**2nd Year**

| Fall Semester | Hours | Spring Semester | Hours |
|---|---|---|---|
| BIOL 6010 | 3 | BIOL 6040 & BIOL 6045 | 4 |
| BIOL 6070 | 3 | BIOL 6130 | 3 |
| BIOL 6900R | 2 | BIOL 6900R | 2 |
| BIOL 6930 | 1 | BIOL 6940 | 1 |
| | **9** | | **10** |

**Total Hours 36**

## Master of Science in Genomics Program Learning Outcomes

At the successful completion of this program, students will be able to:

1. Demonstrate proper safety, aseptic, and sterile laboratory techniques.
2. Perform advanced molecular assays to analyze DNA, RNA, and protein.
3. Apply histological techniques to examine pathological outcomes at tissue and cellular levels.
4. Maintain accurate and detailed laboratory notebooks while performing necessary scientific calculations.
5. Achieve proficiency in techniques associated with animal models or organoid systems.

6. Conduct routine animal husbandry or cell culture tasks, including maintaining experimental animal colonies or cell populations.
7. Design and execute end-to-end experiments in functional genomics and bioinformatics.
8. Operate cutting-edge instruments to collect high-quality experimental data.
9. Perform comprehensive collection, analysis, and interpretation of experimental outcomes.
10. Troubleshoot experimental protocols, equipment malfunctions, and data inconsistencies to optimize workflows and ensure reliable results.