BIOCHEMISTRY AND APPLIED BIOINFORMATICS, MS

Overview

This is a two-year thesis-requiring program for study leading to a Master of Science degree in Biochemistry and Applied Bioinformatics. In year one, students will acquire an academic foundation in biochemistry and bioinformatics and then, in year two, specialize in a sub-field as befits their research or employment interests.

The program is designed to improve the academic credentials and scientific research experience of graduates. Our distinctive program emphasizes student development in six areas (coursework, laboratory skills, bioinformatic analysis, independent thought, presentation skills, and personal growth), allows students to broaden and strengthen their academic foundation, and equips students with basic and advanced lab and bioinformatics skills for a career in academic or industrial research.

Students will take Graduate Biochemistry, Cell Biology, Biostatistics, and Bioinformatics courses, with a strong emphasis on research application of biochemical, molecular and bioinformatic knowledge. Bioinformatics training focuses on skills in the application of diverse tools and databases addressing genomics, gene expression, proteomics, metabolism, and protein structure, function, and drug binding. These courses are taken along with first-year PhD students at the Tulane School of Medicine. All students will benefit from several other Biochemistry- or Molecular Biology-related courses, including a Biochemistry and Molecular Biology Seminar series, a Biochemistry Workshop, and a course on Academic Writing and Critique. All courses are taught within the Tulane School of Medicine by full time faculty.

In year two, students will perform bench or bioinformatic research toward the master's thesis and experience all aspects of basic research under supervision of a faculty advisor, from the development of an idea and scientific rationale, to experimental design and execution, data analysis, and possibly the drafting of a manuscript. Examples of high-level bioinformatics analysis (tools/databases) include the construction of mutational signatures from genome-sequencing data (Blast, Clustal, GenBank, CBioPortal), tumor pathological staging on the basis of gene expression presented in t-SNE projections (10X Genomics), immunological epitope mapping by analysis of protein conformational stability (Protein Data Bank, Swiss-Model), and in-silico drug-screening for protein binding (Autodock).

Requirements

Students must take 30 credit hours of coursework by the end of the spring semester in year two, and they must complete and defend a master's thesis by the end of the summer in year two. Thesis research may commence at the beginning of year one, upon formation of the advisory committee. The student is expected to devote full time to research after the spring semester of year one, and until the thesis defense in the summer of year two.

<table>
<thead>
<tr>
<th>Course ID</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>GBCH 6010</td>
<td>Graduate Biochemistry</td>
<td>4</td>
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<tr>
<td>BMSP 6070</td>
<td>Advanced Cell Biology</td>
<td>3</td>
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<tr>
<td>or BMSP 6050</td>
<td>Advanced Cell Biology - MS</td>
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<tr>
<td>GBCH 6020</td>
<td>Biochemistry and Molecular Biology Seminar</td>
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<tr>
<td>BMSP 7110</td>
<td>Workshop</td>
<td>1</td>
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<td>INTD 6010</td>
<td>Responsible Conduct of Research</td>
<td>0</td>
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<td>GBCH 7230</td>
<td>Introduction to Bioinformatics</td>
<td>3</td>
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<tr>
<td>GBCH 7110</td>
<td>Selected Topics</td>
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Year 1, Spring

Required Courses

GBCH 7250 Biomedical Statistics and Data Analysis 2
GBCH 7100 Seminar 1
BMSP 7110 Workshop 1
GBCH 7170 Principles of Genetics 4
GBCH 7330 Advanced Bioinformatics 3
Electives

GBCH 7550 Med Biochem Grand Rounds Exter
GBCH 6110 Basic Medical Biochemistry
GBCH 7120 Special Problems

Year 2, Fall

Required Courses
<table>
<thead>
<tr>
<th>Course Code</th>
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<tr>
<td>GBCH 6020</td>
<td>Biochemistry and Molecular Biology Seminar</td>
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<tr>
<td>BMSP 7110</td>
<td>Workshop</td>
<td>1</td>
</tr>
<tr>
<td>BIMI 6200</td>
<td>Introduction to Data Science for Biomedical Informatics</td>
<td>3</td>
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**Electives**
- GBCH 7560: Academic Writing & Critique
- GBCH 7130: Selected Topics
- GBCH 7150: Tutorial Topics

**Year 2, Spring**

**Required Courses**
- GBCH 6020: Biochemistry and Molecular Biology Seminar
- BMSP 7110: Workshop

**Electives**
- GBCH 7120: Special Problems
- GBCH 7160: Tutorial Topics