

## **UNDERGRADUATE HONORS PROGRAM FISCHELL DEPARTMENT OF BIOENGINEERING**

The Fischell Department of Bioengineering Undergraduate Honors Program is a research-oriented, thesis-based enrichment experience that serves to augment the curriculum by providing practical, hands-on learning opportunities. The primary goal of the Honors program is to develop BIOE graduates who will be among the most competitive applicants for graduate and medical school programs, as well as industry jobs. Toward this end, the program provides exceptional undergraduate students with training in academic and professional pursuits while offering a formal mechanism to be recognized for scholarly achievements.

Specifically, the program is designed to provide education and training in leadership, professional development, academic writing, academic presentations, and career awareness. Above all, however, the Honors Program enriches the students' academic experiences and better prepares students for their next career step through immersion in bioengineering research. Regardless of the next step – a Ph.D., medical school, a career as an engineer in the industry, or nearly anything else – excelling in undergraduate research prepares a student for advancement in their future endeavors. This is because research places students in a unique position; a researcher must solve a problem that has not been solved before. Graduates who have intensely pursued undergraduate research will have obtained valuable research aptitude and experience, a solid understanding of the research methods that lead to clinical advances, creative and critical thinking skills, leadership capabilities, teamwork, and effective communication styles – all of which are coveted assets in any career in bioengineering and medicine.

### **Program Guidelines**

- Students should identify a faculty mentor engaged in bioengineering-related research. For faculty advisors outside of the department who are not affiliate or adjunct faculty members, a BIOE departmental co-advisor should be sought to ensure that the research has an acceptable bioengineering component.
- With input from the faculty mentor, students should propose an independent research project to be completed during their final two years.
- Faculty mentors must commit to guide the student through his/her research project and provide appropriate facilities to complete the proposed project.
- Students are welcome to participate in other honors programs, but research completed for the BIOE Honors Program may not be used to satisfy the requirements of another honors program.
- Students may not be paid for coursework, including BIOE399H. However, the faculty mentor has the option to pay the student for work done towards the thesis, or the student may apply for a fellowship, as long as no coursework is being earned (analogous to a Masters degree student). For example, these options could be pursued in semesters, or the summer, when students are not enrolled in BIOE399H.

## Admissions

Applications for the Bioengineering Honors Program are accepted each spring. Students with two years remaining in their undergraduate matriculation will receive the strongest consideration, though other exceptional cases may be considered. Typically, students will apply during their sophomore year and complete the program during their junior and senior years. However, students planning to complete the degree in 5 years may apply in their 3<sup>rd</sup> year and complete the program during their 4<sup>th</sup> and 5<sup>th</sup> years. Applications are reviewed and voted upon by the Fischell Department Undergraduate Affairs Committee. Application details and forms are available on the Bioengineering Department Website.

- Deadline: April 30 of each year.
- Applications will be reviewed by a faculty committee following the deadline. Students will be notified of the admissions decisions by June 1 of each year.
- Academic standing: Students with a GPA of 3.5 and higher will receive the strongest consideration, though all students with a 3.0 or higher are invited to apply.
- Application contents: Applicants must submit a personal statement, a research proposal, an up-to-date transcript, and a Faculty Mentor Evaluation Worksheet.

## Requirements for completion

- Maintain GPA at time of acceptance to the Honors Program.
- Conduct research for at least four semesters under the supervision of a faculty mentor.
- Complete six credits of BIOE399H (3 credits can be counted as a BIOE elective).
- Complete three semesters of BIOE489H (1 credit each).
- Complete one 600-level BIOE elective.
- Attend at least four research seminars in the second and third semesters and submit brief summaries; it is preferred that the students attend the BIOE seminar, but other seminars, such as CHBE, ENMA, MOCB, etc. are acceptable.
- Complete the “Junior Review” successfully in BIOE489H during the second semester.
- Present a research update to the BIOE489H class during the third semester.
- Present a research poster in an external academic conference or an on-campus research fair.
- Complete an academic thesis and defend the thesis to an approved faculty committee.

## BIOE489H

### First semester of BIOE 489H (Fall)

Students in the Honors Program are required to complete three semesters of BIOE489H. In their first semester of the program they will be required to attend all the seminar meeting times for BIOE489H (approximate schedule below); in subsequent semesters students may only be asked to attend certain meeting times. This weekly seminar includes educational programs in leadership and academic writing, as well as career awareness programs, including a professional alumni panel and a graduate school information session. Finally, the seminar offers the opportunity to practice and improve academic presentation skills, as first year students will present research updates, while seniors will visit the class to present a research presentation in the style of an academic conference.

## BIOE489H contents

Ethics in research	2 weeks
Communicating science (reading literature, designing figures, giving poster and oral presentations, writing papers and thesis)	5 weeks
Time management	1 week
Graduate school information session and alumni panel	2 weeks
Research proposal presentations by BIOE489H students	2 weeks
Research updates by Honors Program seniors	2-3 weeks

### Second semester of BIOE489H (Spring)

During the second semester of BIOE489H, students will attend at least four research seminars and submit brief summaries using the provided template; it is preferred that the students attend the BIOE seminar, but other seminars, such as CHBE, ENMA, MOCB, etc. are acceptable. In addition, students must pass a **“Junior Review”** examination at the end of their first year in the Honors Program. For the Junior Review, students will give an oral presentation to a committee composed of the Honors Program Director and the student's research mentor. The presentation should follow the format of the thesis defense (see below) and should also highlight work completed and work still to be completed. The student must demonstrate an acceptable level of productivity and understanding of their project in order to continue in the Honors Program through their senior year. More details on the timing and format of the Junior Review will be provided in the BIOE489H syllabus.

### Third semester of BIOE 489H (Fall)

During the third semester of BIOE489H, students will attend at least four research seminars and submit brief summaries using the provided template; it is preferred that the students attend the BIOE seminar, but other seminars, such as CHBE, ENMA, MOCB, etc. are acceptable. In addition, senior students will visit the BIOE489H junior class and present a research presentation in the style of an academic conference.

## **Honors thesis**

To complete the Honors Program, students will write and defend a research thesis based on the research conducted during the program. This is an examination of research aptitude, academic writing, and academic presentation skills that provides tremendous benefits in professional development for the student.

### Thesis guidelines:

- The student must use the thesis template available from the University of Maryland.
- The thesis should include:
  - Abstract.
  - Introduction and motivation.
  - Background, including an overview of the field and a detailed literature review.
  - The research, including introduction, methods, results, and summary (typically 2-3 chapters).

- Conclusions, including a general summary, future work, and a list of contributions to the field.
- A typical thesis should be between 40-60 pages.

#### Thesis defense:

- The committee consists of three faculty members and is led by the student's research mentor; two of the committee members must be primary faculty in the Fischell Department of Bioengineering.
- The student delivers a presentation to the committee and to the public (approximately 25 minutes) that summarizes the contents of the thesis, including an introduction, background, research methods, research results, a summary, and the student's contributions to the field.
- Following the presentation, the research mentor leads a closed session in which the student responds to questions from the committee members.
- At the outcome of the defense, the committee will determine if the student passes, does not pass, or passes based on recommendations for revisions.

#### Thesis timeline

*Note that the timeline is described in reverse chronological order – students should choose an appropriate defense date early in their final semester and work backwards to determine their individual timeline:*

- Final Thesis Submission (to department): must be submitted by the student before reading day of the student's final semester.
- Thesis Defense: must be at least three weeks before reading day of the student's final semester.
- Thesis Submission (to committee members): must be submitted by the student at least one week before the defense.
- Thesis Abstract & Defense Announcement Submission (to department): must be submitted by the student at least two weeks before the defense.
- Thesis Committee Approval: must be approved by the Bioengineering Department at least four weeks before the defense. Students are responsible for sending the list of committee members (who have agreed in writing, e.g., through email, to serve on the committee) to the department by this date.

Note: In all aspects of the BIOE Honors Program, students are required to follow the University of Maryland Code of Academic Integrity. See the following website for details:

<https://www.president.umd.edu/sites/president.umd.edu/files/documents/policies/III-100A.pdf>