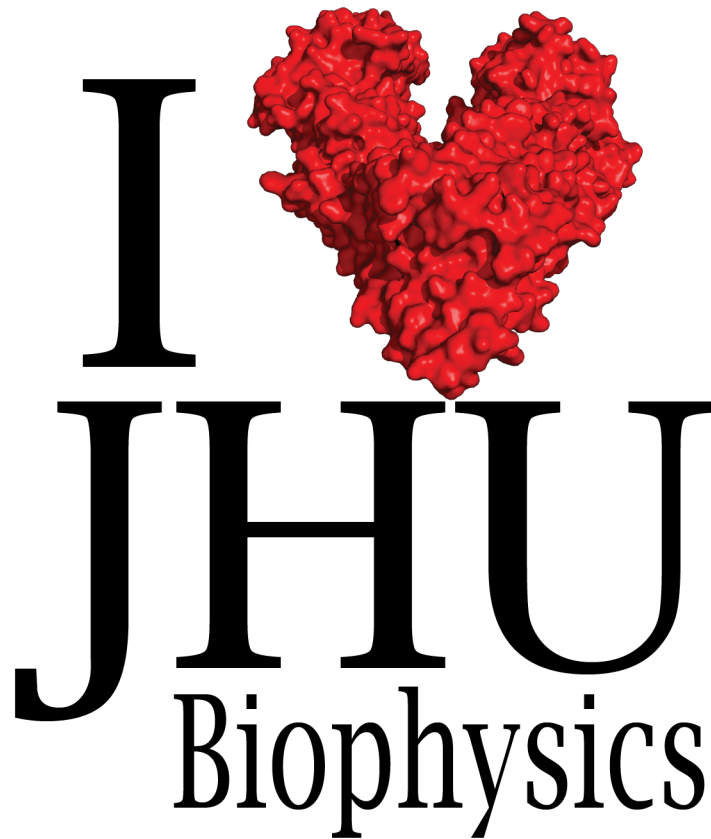


Thomas C. Jenkins Department of

BIOPHYSICS

---Undergraduate Advising Manual---



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biophysics.jhu.edu
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Table of Contents

1. Introduction	1
1.1 What is Biophysics?.....	1
2. Program Mission and Objectives	1
2.1 Who are the Biophysics undergraduates?	2
2.2 What do the Biophysics undergraduate alumni do?	2
3. Resources for Students	2
3.1 The Jenkins Faculty.....	2
3.2 Current Biophysics Majors: The Biophysics Buddies.....	3
3.3 Undergraduate Newsletters	3
3.4 Our Undergraduate Alumni.....	3
3.5 Social Media	3
3.5.1 JHU BiPhi ΦΦ Facebook Page	3
4. Departmental Advising Procedures	4
4.1 Faculty Advisors	4
4.1.1 Meetings with your faculty advisor.....	4
4.1.2 What to bring to an advisor meeting?.....	4
4.1.3 Obtaining a faculty advisor as a freshman	4
4.1.4 Switching into biophysics as an upperclassman	5
5. Examples of Paths for Completion of the Major	5
5.1 For the Biophysics Major with the Goal of pursuing Graduate School.....	6
5.2 For the Biophysics Major with the Goal of pursuing Medical School	7
5.3 Courses suitable for freshmen with AP credits who intend to major in biophysics	8
6. Degree Checklists	8
7. Degree Requirements	8
7.1 Curriculum.....	8
7.1.1 Required Chemistry Courses	8
7.1.2 Required Physics Courses	9
7.1.3 Required Biophysics Courses	10
7.1.4 Required Math Courses.....	10
7.1.5 Required Research Experience	11
7.1.6 Pre-2024 JHU Admits only: Advanced Seminar Requirement	11
7.2 Required Natural Science Electives.....	11
7.2.1 “List 1” Electives.....	12
7.2.2 Pre-2024 JHU Admits only: “List 2” Electives	12
7.3 Students entering JHU with AP Credits	13
7.4 Transfer credits	13
7.5 Study Abroad	13
7.6 KSAS Requirements	14
7.6.1 Writing Course Requirements	14
7.6.2 Humanities and Social Science Requirements	15
7.7 Academic Performance Rules	15
7.7.1 Minimum Grade Requirements	15

7.7.2	Repetition of Course Content.....	15
7.7.3	Courses Taken Pass/Fail.....	15
7.7.4	Double Counting Policy.....	15
7.7.5	Departmental Honors Program.....	15
7.7.6	Ethics in Learning.....	16
8.	MS in Biophysical Chemistry and Design for Biotechnology.....	17
9.	No Minor in Biophysics.....	17
10.	Undergraduate Planning for Professional Schools.....	17
10.1	Graduate School Requirements.....	17
10.1.1	Computational Electives.....	17
10.1.2	Research Experience.....	17
10.2	Considerations for Completion of the Pre-Medical Requirements.....	18
10.2.1	Organic Chemistry Lab.....	18
10.2.2	College level “biology” course.....	18
10.2.3	College level “biochemistry” or “biology” lab.....	18
10.2.4	Statistics.....	19
10.2.5	Sociology/Psychology.....	19
11.	Faculty Contact List.....	20
	Course Listings.....	2
12.	Appendix A: Undergraduate Research Guide for Biophysics Majors.....	12-1
13.	Appendix B: Departmental Honors in Biophysics.....	13-1
13.1	Eligibility.....	13-1
13.2	Honors Paper.....	13-1
13.2.1	Honors Paper Layout.....	13-1
13.2.2	Honors Paper Due Date.....	13-2
14.	Appendix C: Are you considering graduate school?.....	14-1
15.	Appendix D: Undergraduate Awards.....	15-1
16.	Appendix E: History of Jenkins Biophysics.....	16-1

1. Introduction

Welcome to the Department of Biophysics!

Johns Hopkins University was one of the first institutions in the country to establish Biophysics as an independent discipline and to have a department dedicated to studying biology using the tools and approaches of physics and physical chemistry.

The Thomas C. Jenkins Department of Biophysics has a long tradition of excellence in research and teaching, and of developing leaders in the scientific community. We are proud of the role the Jenkins Department has played in advancing biophysics and we invite you to learn more about us.

1.1 What is Biophysics?

Biophysics is the application of the laws of physics to biological phenomena. Biophysics uses the languages of math and computation in seeking to describe biology in quantitative terms. As such, biophysics has been referred to as a bridge between biology and physics.

Studies in the discipline of biophysics are particularly timely and important because biology is currently undergoing an incredible transformation. We now can know the entire DNA sequence of a person. For \$99, anyone can have snippets of their genome sequence determined and their ancestry revealed or potential illnesses predicted from this information.¹ A complete catalog of all molecules is being assembled, ranging from the great to the small in millions of organisms, and from all kingdoms of life. The grand intellectual challenges in biology for the 21st century will be to understand how all the molecules in a cell interact to give rise to the living state, to envision how life emerges from the interactions among molecules, and to know how life originated and how it continues to evolve.

Because the field of biology is transforming from an observational and phenomenological science into a quantitative and physical one, Johns Hopkins is fortunate to have a Biophysics department and a strong, vibrant and active community of biophysicists already focused on the study of biology from the quantitative and physical perspectives.

2. Program Mission and Objectives

The Hopkins major in biophysics has always been a rigorous and challenging major that attracts students interested in biology who are not afraid of mathematics, physics, and computation. The goal of the major is to achieve true integration between biology, chemistry, physics, mathematics and computation, and our majors are required to become competent in all five areas.

However, interdisciplinary education is not just a matter of taking courses in different departments. The strength of our major is that we integrate all these scientific areas. This is accomplished through our courses in biophysics, in our advanced laboratory course, and through

¹ 23andme.com, whole genome SNP service

our independent research requirement. Key to our goal is the fact that our courses emphasize concepts and problem solving over memorization. We train our students to become thinkers who will have the quantitative skills and technical abilities to address any biological problem at hand.

Another unique aspect of Biophysics is the close contact between majors and the faculty in the Biophysics Department. As faculty we provide our majors with individualized and personal mentorship, rivaling that available at small, first-rate private liberal colleges. Our upper-level courses are small, and the intimate contact between faculty and students both inside and outside the classroom allows us to get to know the students well and *vice versa*.

2.1 Who are the Biophysics undergraduates?

Because the major attracts outstanding students who are interested in biology and comfortable with mathematics and physics, the undergraduate biophysics majors enjoy and appreciate the highly interdisciplinary training. It is usual for the average GPA of our graduating class to qualify for University Honors. A disproportionate number of Biophysics majors are elected to Phi Beta Kappa every year. They have a very high success rate of acceptance to medical and graduate schools.

Over and above their excellent academics, our majors are generally a happy and cohesive set of students. They form study groups and help each other master concepts from class and complete assignments. This sense of camaraderie and teamwork translates back into the classroom and into one-on-one interactions between majors and faculty; indeed, teaching and working with biophysics majors is a pleasure for the faculty.

2.2 What do the Biophysics undergraduate alumni do?

Biophysics majors typically go to medical (70%) or doctoral (15–20%) or combined MD/PhD (5%) programs after graduation. Medical schools that the recent graduates have attended include Albert Einstein, Columbia, Harvard, Johns Hopkins, Stanford, University of Chicago, University of Maryland, and Yale. Graduate schools that recent graduates have attended include Harvard, Yale, New York University, Stanford, UC Berkeley, University of California San Francisco, University of Chicago, and Washington University, in St. Louis.

3. Resources for Students

3.1 The Jenkins Faculty

The Jenkins faculty members are the main resources for prospective majors. We are a friendly department who love what we do, and we encourage you to email any of us if you have questions about the major or the classes we teach.

3.2 Current Biophysics Majors: The Biophysics Buddies

In addition, our upperclassmen are always eager to share their enthusiasm for the biophysics major. Freshmen have opportunities to meet upper classmen as teaching assistants in our classes and at our biophysics parties or poster sessions.

We also run a student-led mentoring program, Biophysics Buddies, whereby freshmen will be paired with upperclassman in the major. The current (2025–26) leaders are seniors: Alia Basler and Joshua Khorsandi. They will reach out to all declared majors, but you can also contact them directly.

3.3 Undergraduate Newsletters

Prospective majors can obtain a sense for who our majors are from our undergraduate newsletters. The spring versions contain “senior profiles” and highlight the graduating class each year. The newsletters are printed and available in the main hall of Jenkins across from room 110.

3.4 Our Undergraduate Alumni

Because they love their experience here so much, our alumni are happy to serve as a resource for our current majors. This can be especially helpful for our upper classmen as they contemplate graduate or medical schools. The Director of Undergraduate Studies (DUS), Prof Margaret Johnson, maintains a list of undergraduate alumni who have agreed to be contacted by current students.

3.5 Social Media

3.5.1 JHU BiPhi ΦΦ Facebook Page

Current majors take part in the undergraduate Facebook page, where you can play Biophysics Bingo, view Biophysics majors doing an interpretive dance modelling the helix coil transition, get a ride to the annual Biophysical Society meeting, or view the Fourier transform of a cat.

<https://www.facebook.com/groups/220752411311415/>

Many of our alumni are also members of this Facebook group, and this can be a good way to meet your cohorts and learn what they are doing after graduation.

4. Departmental Advising Procedures

4.1 Faculty Advisors

Once you declare biophysics as your major, a full-time faculty member in the Jenkins Department of Biophysics will serve as your academic advisor. We are genuinely interested in your success, and we want to help you find a set of course work that meets your interests.

4.1.1 Meetings with your faculty advisor

As current majors you will generally meet with your advisors at least once each semester to plan your courses for the upcoming semester and to discuss current courses. Before registration, the JHU registrar's office places a hold on all student accounts. This hold will be released by your faculty advisor upon completion of a meeting with them.

It is important that you email your faculty advisor in a timely manner to set up an appointment to meet with him or her. "Showing up" in a faculty member's office can sometimes result in a meeting, but the conversation will be much more productive if both of you have advanced notice for a meeting and can be prepared. Contact information for the faculty can be found in Section 10 or on the web site.

4.1.2 What to bring to an advisor meeting?

You will get the most out of your Hopkins experience if you learn to plan your schedule in advance. Therefore, the most important planning tool to accomplish this is to consult the degree audit for the major. Because degree audit is now exclusively online, it is helpful if you can bring your laptop with you to your advisor meeting.

The instructions for degree audit, now Stellic, can be found on this site:

<https://advising.jhu.edu/completing-your-degree/degree-auditing/>

4.1.3 Obtaining a faculty advisor as a freshman

Although Johns Hopkins does not generally allow freshmen to declare a subject major, freshmen (pre-majors) interested in the major should feel free to email the Director of Undergraduate Studies (DUS) to set up a meeting to discuss their interests and current course plan and how the biophysics major can fit with their goals.

Many freshmen declare biophysics as their major during the spring. When this happens—usually in late April—the JHU Advising office forwards their names to the Biophysics DUS, and they are assigned faculty advisors. The DUS then emails advisor's name and email address to the entering major. Upon receiving this email, entering majors should email their new advisors to arrange a meeting to discuss plans for sophomore year.

4.1.4 Switching into biophysics as an upperclassman

If you are currently an upperclassman and wish to major in biophysics, stop by the registrar's office to obtain a "change of major" form and email the biophysics DUS to set up an appointment to discuss your long-term goals and how your past course work fits the major requirements. The DUS will also assign a faculty advisor to you and sign your change of major form at this meeting.

Students typically transfer to Biophysics from majors in Molecular & Cellular Biology, Chemical & Biomolecular Engineering, Chemistry, and Physics. Transfers are typically during the sophomore year, although transfers are still possible in the junior year depending on completed course work.

5. Examples of Paths for Completion of the Major

The following two sections (5.1 and 5.2) show examples for completion of the biophysics major for incoming students without AP credits. Section 5.3 lists Biophysics courses that are appropriate for freshmen with AP credits. These are only examples; many other scenarios are acceptable. Starting with entry year 2024, H/S requirements are phased out and FA requirements phased in. See section 7.

5.1 For the Biophysics Major with the Goal of pursuing Graduate School

Freshman Year Fall			Freshman Year Spring		
030.101	Intro Chemistry I	3	030.102	Intro Chemistry II	3
030.105	Intro Chemistry I Lab	1	030.106	Intro Chemistry II Lab	1
110.108	Calculus I	4	110.109	Calculus II	4
171.101	General Physics I	4	171.102	General Physics II	4
173.111	General Physics I Lab	1	173.112	General Physics II Lab	1
H/S Elective		3	H/S Elective		4
		Semester Credits			Semester Credits
		16			17
		<i>Cumulative Credits</i>			<i>Cumulative Credits</i>
		16			33
Sophomore Year Fall			Sophomore Year Spring		
030.205	Organic Chemistry I	4	030.206	Organic Chemistry II	4
110.202	Calculus III	4	110.201	Linear Algebra	4
250.253	Protein Engineering and Biochem Lab (PEBL)	3	250.372	Biophysical Chemistry	4
			250.205	Intro Scientific Comp	3
H/S Elective		6			Semester Credits
		17			15
		<i>Cumulative Credits</i>			<i>Cumulative Credits</i>
		50			65
Junior Year Fall			Junior Year Spring		
250.315	Biochemistry I	4	250.316	Biochemistry II	3
250.302	Modeling the Living Cell	4	250.383	Mol Biophysics Lab	3
250.520/1	Biophysics Research	3	250.520/1	Biophysics Research	3
171.310	Biological Physics	4			
H/S Elective		2	H/S Elective		6
		Semester Credits			Semester Credits
		17			15
		<i>Cumulative Credits</i>			<i>Cumulative Credits</i>
		82			96
Senior Year Fall			Senior Year Spring		
List 1/2 Elective	One of the following is recommended:	3	List 1/2 Elective	One of the following is recommended:	3
250.421	Adv Sem Membrane Proteins		250.411	Adv Sem Structural Biology of Chromatin	
			or		
			250.401	Adv Sem Macromolecular binding	
Open Elective		6	250.381	Spectroscopy	3
H/S Elective		3	Open Elective		6
		Semester Credits			Semester Credits
		12			12
		<i>Cumulative Credits</i>			<i>Cumulative Credits</i>
		108			120

Note: Biophysics Research starts with AS.250.520 (6 cr. S/U) and continues with AS.250.521 (letter grade). Pre 2024 requirement is a minimum of 6 cr.; starting in 2024, requirement is a minimum of 2 cr. See section 7.1.5. AS.250.383 and some advanced seminars carry writing credits.

5.2 For the Biophysics Major with the Goal of pursuing Medical School

Freshman Year Fall			Freshman Year Spring		
030.101	Intro Chemistry I	3	030.102	Intro Chemistry II	3
030.105	Intro Chemistry I Lab	1	030.106	Intro Chemistry II Lab	1
110.108	Calculus I	4	110.109	Calculus II	4
171.101	General Physics I	4	171.102	General Physics II	4
173.111	General Physics I Lab	1	173.112	General Physics II Lab	1
H/S Elective		3	H/S Elective		4
		Semester Credits	Semester Credits		
		<i>Cumulative Credits</i>	<i>Cumulative Credits</i>		
		16	17		
		16	33		
Sophomore Year Fall			Sophomore Year Spring		
030.205	Organic Chemistry I	4	030.206	Organic Chemistry II	4
030.225	Intro Organic Chem Lab	3	110.201	Linear Algebra	4
110.202	Calculus III	4	350.372	Biophysical Chemistry	4
250.253	Prot Eng & Biochem Lab	3	250.205	Intro Scientific Comp	3
H/S Elective		3			
		Semester Credits			Semester Credits
		<i>Cumulative Credits</i>			<i>Cumulative Credits</i>
		17			15
		50			65
Junior Year Fall			Junior Year Spring		
250.315	Biochemistry I	4	250.316	Biochemistry II	3
250.302	Modeling the Living Cell	4	250.383	Mol Biophysics Lab	3
171.310	Biological Physics	4			
250.520/1	Biophysics Research	3	250.520/1	Biophysics Research	3
H/S Elective		2	H/S Elective		3
		Semester Credits			Semester Credits
		<i>Cumulative Credits</i>			<i>Cumulative Credits</i>
		17			15
		82			96
Senior Year Fall			Senior Year Spring		
<i>List 1 elective</i>	Two of the following is recommended:	6	<i>List 1 elective</i>	One of the following is recommended:	3
250.421	Adv Sem Membrane Proteins		250.411	Adv Sem Structural Biology of Chromatin	
			or		
			250.401	Adv Sem Macromolecular Binding	
553.311	Probability & Statistics for Biological Sciences	3	H/S Elective		6
H/S Elective		3	250.381	Spectroscopy	3
		Semester Credits			Semester Credits
		<i>Cumulative Credits</i>			<i>Cumulative Credits</i>
		12			12
		108			120

Note: Biophysics Research starts with AS.250.520 (6 cr. S/U) and continues with AS.250.521 (letter grade). Pre 2024 requirement is a minimum of 6 cr.; starting in 2024, requirement is a minimum of 2 cr. See section 7.1.5. AS.250.383 and some advanced seminars carry writing credits.

5.3 Courses suitable for freshmen with AP credits who intend to major in biophysics

The JHU Office of Academic Advising maintains policies about acceptance and equivalencies of AP credits for incoming freshmen. The Jenkins Biophysics department follows their guidelines and accepts their recommendations regarding AP credits for required courses.

The following biophysics course is suitable for freshmen with AP credits and will allow those students to get started on completing the requirements for the major.

AS.250.205 Introduction to Computing (Fall or Spring)

This course has no pre-requisites, and no special permission is required for freshmen to take it.

6. Degree Checklists

The JHU Office of Academic Advising maintains an up-to-date listing of requirements for the Biophysics major:

<https://e-catalogue.jhu.edu/arts-sciences/full-time-residential-programs/degree-programs/biophysics/>

<https://e-catalogue.jhu.edu/arts-sciences/full-time-residential-programs/degree-programs/biophysics/biophysics-bachelor-arts/>

The e-catalogue is used for Degree Audit (graduation requirements) and this is what the University follows. **Please check this, as it can change from year-to-year.**

Please check stellic.jhu.edu, the current tool for Degree Audit. Note the electives List can change due to new course options. This manual is updated each semester to stay current, but ultimately some courses must be pushed as exceptions within stellic.

7. Degree Requirements

NEW For JHU students entering Fall 2024 or later, the degree requirements have been reduced significantly in accord with the new vision of the [CUE2](#) General Education undergraduate curriculum tailored to 6 [Foundational Abilities](#) (FAs). Students complete **15 credits** within each of the FAs, except #6 is only 6 credits. #1 Writing and Communication. #2 Science and Data. #3 Culture and Aesthetics. #4 Citizens and Society. #5. Ethics and Foundations. #6 Projects and Methods (6 credits).

****Students who entered JHU prior to Fall 2024 need to follow the earlier curriculum, without FAs.****

7.1 Curriculum

Classes below are required for all students. Requirements unique to **Pre-2024 admits are highlighted in red text. If you are a junior or senior for the 2025–2026 academic year, this means you!**

7.1.1 Required Chemistry Courses

The biophysics major requires 6 courses in chemistry.

1. AS.030.101 Introductory Chemistry I
 2. AS.030.102 Introductory Chemistry II
 3. AS.030.105 Introductory Chemistry Laboratory I
 4. AS.030.106 Introductory Chemistry Laboratory II
 5. AS.030.205 Organic Chemistry I
 6. AS.030.206 Organic Chemistry II with Biochemistry (preferred choice)
- or
- AS.030.212 Advanced Organic Chemistry

7.1.2 Required Physics Courses

The biophysics major requires 4 courses in physics:

- 1 first year physics lecture series (2 courses);
- 1 first year physics lab series (2 courses); and

For the first-year physics lecture series, there are four options. All of these are accepted by the Biophysics major; however, the preferred series is Option 1 (traditional didactic format) or Option 2 (flipped format) below:

First Year Physics Option 1:

1. AS.171.101 General Physics: Physical Science Major I
and
2. AS.171.102 General Physics: Physical Science Major II

OR

First Year Physics Option 2:

1. AS.171.107 General Physics for Physical Science Majors I (AL)
and
2. AS.171.108 General Physics for Physical Science Majors II (AL)

In lieu of the 101/102 or 107/108 physics series, the biophysics major also accepts one of the following series:

First Year Physics Option 3:

1. AS.171.103 General Physics I for Biological Science Majors
and
2. AS.171.104 General Physics II for Biological Science Majors

OR

First Year Physics Option 4 (primarily for students double-majoring in physics and biophysics):

1. AS.171.105 Classical Mechanics I
and
2. AS.171.106 Electricity and Magnetism

For the first year of physics labs, two series are available:

First Year Physics Lab Option 1 (for students choosing lecture options 1, 2, or 3):

1. AS.173.111 General Physics Laboratory I
and
2. AS.173.112 General Physics Laboratory II

OR

First Year Physics Lab Option 2 (for students choosing lecture option 4):

Generally, only students seeking to double major in both physics and biophysics will choose this series.

1. AS.173.115 Classical Mechanics Laboratory
and
2. AS.173.116 Electricity and Magnetism Laboratory

7.1.3 Required Biophysics Courses

The biophysics major requires 5 courses in biophysics.

1. AS.250.205 Introduction to Computing
2. AS.250.372 Biophysical Chemistry (requires Introduction to Computing)
3. AS.250.315 Biochemistry I
4. AS.250.381 Spectroscopy and its Application in Biophysical Reactions
(requires Biophysical Chemistry and Biochemistry I)
5. AS.250.383 Molecular Biophysics Laboratory (approval required.)

7.1.4 Required Math Courses

The biophysics major requires 4 courses of mathematics, including the three semester calculus series and a fourth specialized math course. The three calculus courses are

1. AS.110.108 Calculus I
2. AS.110.109 Calculus II (for Physical Sciences and Engineering)
3. AS.110.202 Calculus III or AS.110.211 Honors Multivariable Calculus

The fourth specialized can be any of the following:

- 4a. AS.110.201 Linear Algebra
- 4b. AS.110.212 Honors Linear Algebra
- 4c. AS.110.302 Differential Equations and Applications
- 4d. EN.553.291 Linear Algebra & Differential Equations
- 4e. EN.553.311 Intermediate Probability and Statistics
- 4f. EN.553.310 Probability and Statistics for Phys. Sciences and Engineering
- 4g. EN.553.211 Probability and Statistics for Life Sciences

7.1.5 Required Research Experience

Students entering JHU Fall 2024 and later: As of Fall 2026, the research requirement for the major in biophysics will be 3 credits, by taking the course AS.250.520, entitled “Introduction to Biophysics Research”. From Fall 2024-Spring 2026, it was 2 credits required. This course is not given a letter grade but is taken S/U. **Students can register for between 1 and 3 credits.**

Students entering JHU before Fall 2024: The research requirement for the major in biophysics is **6 credits**, by taking two semesters of the course AS.250.520, entitled “Introduction to Biophysics Research”. This six-credit sequence is not given a letter grade but is taken S/U.

All students: After completing 6 credits of AS.250.520 research, students are encouraged to continue their research, enrolling in the course AS.250.521 entitled “Research in Biophysics”. Because students will have improved proficiency in independent research after completing 6 credits, they can take AS.250.521 for a letter grade, but for no more than six credits per year. All research courses are offered in the fall, spring, and summer terms. Note that research during Intersession is not for credit.

A full description of the research requirements and how to find a research experience can be found in Section 12: Appendix A.

Two important things about the research requirement to keep in mind:

Intersession research (250.574) can be conducted for a grade but **does not count** towards the major.

The Registrar’s academic year starts with the summer session, and only 6 credits of research can be earned within any one academic year. In other words, the Registrar does not allow 3 credits to be earned in the summer and 3 credits to be earned in both the following fall and spring semesters.

7.1.6 Pre-2024 JHU Admits only: Advanced Seminar Requirement

Students must complete a course from the Advanced Seminar List.

250.403	Advanced Seminar Bioenergetics
250.421	Advanced Seminar in Membrane Protein Structure, Function & Pharmacology
250.411	Advanced Seminar in Structural Biology of Chromatin
250.420	Advanced Seminar in Macromolecular Binding
250.406	Single-molecule Biophysics
250.412	Advanced Seminar in Quantitative Cell Biology

7.2 Required Natural Science Electives

Three natural science electives are required.

7.2.1 “List 1” Electives—By Admit year

A minimum of three “List 1” electives must be taken from the following set. These electives represent the courses taught by the Biophysics Faculty, listed in Sec. 11. Exceptions are AS.250.253 Protein Engineering and Biochemistry Lab, taught by Biophysics Teaching Faculty, and undergraduate Biological Physics, and Systems Genome Biology. Check the course catalog for when these courses are offered (schedule may vary from year to year). Also check the FA tags as these may evolve over the years.

NOTE: The red courses are **only eligible List 1 electives for Pre-Fall 2024 Admits, and for Fall 2024 and Fall 2025 Admits if needed.** As of Spring 2026, we have modified this list to only include courses taught by Biophysics faculty. The Blue course is also eligible for List 1 up-to and including taking the course in Spring 2026.

AS.250.253/254	Protein Engineering and Biochemistry Laboratory
AS.250.302	Modeling the Living Cell (Fall) (Johnson)
AS.250.316	Biochemistry II (Spring) (Woodson)
AS.171.310	Biological Physics (Beller-Physics)
AS.171.648	Physics of Cell Biology: From Mechanics to Information (Zhang)
AS.171.650	Biological Physics: Theory and Computation (Zhang)
AS.250.405	Systems Genome Biology (Blagoev)
AS.250.406	Physical Principles of Signal Transduction (Fall) (Quantitative Analysis of Cell Signaling) (Huang)
AS.250.416	Biophysical Techniques and Their Applications (Spring) (He)
AS.250.403	Advanced Seminar Bioenergetics ¹ (Garcia-Moreno)
AS.250.421	Advanced Seminar in Membrane Protein Structure, Function & Pharmacology ¹ (Fleming)
AS.250.411	Advanced Seminar in Structural Biology of Chromatin ¹ (Bowman)
AS.250.420	Advanced Seminar in Macromolecular Binding ¹ (Fleming)
AS.250.206	Mathematical Methods for Biophysics (K. Reynolds)
AS.250.412	Advanced Seminar in Quantitative Cell Biology (B. Camley)
AS.250.407	Single-Molecule Biophysics (T. Graham)

AS.250.450	Special Topics in Macromolecular Therapeutics
AS.171.201	Special Relativity and Waves
AS.171.202	Modern Physics
EN.605.202	Data Structures
EN.601.220	Intermediate Programming

¹ Students entering JHU Pre-Fall 2024 cannot double count one advanced seminar to both the Advanced Seminar requirement and to the List 1 requirement.

7.2.2 Pre-2024 JHU Admits only: “List 2” Electives

Three courses are required from “List 2” electives. Check the course catalog for when these courses are offered (schedule may vary from year to year).

AS.020.306	Cell Biology
AS.020.330	Genetics
AS.020.344	Virology
AS.020.346	Immunology
AS.020.363	Developmental Biology
AS.020.380	Eukaryotic Molecular Biology
AS.171.310	Biological Physics
AS.250.310	Exploring Protein Biophysics using nuclear Magnetic Resonance (NMR) Spectroscopy
EN.553.311	Probability and Statistics for the Biological Sciences and Engineering

Additionally, any 3-credit or higher 300-level or higher course in the Departments of Biology, Biophysics, Chemistry, Math, or Physics can be used as List 2 electives. This includes courses in List 1 that are not being counted as list 1 electives. Advanced seminar classes also count towards List 2, but cannot be double-counted with the Advanced Seminar requirement.

NOTE: We do not accept Gateway Java/Python as a list 1 or list 2 as it is 100-level and is redundant with Introduction to Scientific Computing (AS.250.205).

7.3 Students entering JHU with AP Credits

The JHU Office of Academic Advising maintains policies about acceptance and equivalencies of AP credits for incoming freshmen. The Jenkins Biophysics department adheres to these policies.

7.4 Transfer credits

The majority of transfer credit requests in the Jenkins Biophysics department concern courses in chemistry, physics, mathematics and biology. We do not normally make any decisions about the appropriateness of any transfer courses in those subject areas. Rather, we defer to departments at JHU for all decisions about whether courses taken elsewhere are equivalent to the respective JHU courses.

Prior to taking any courses outside of Hopkins, biophysics majors desiring to take courses at other institutions and bring credits back to JHU should seek approval from the JHU Advising office as well as the DUS in the department in which the course is offered. Often the DUS in that department will require a syllabus and course description for consideration.

As with transfer credits, if the other department accepts the courses as equivalent to their own courses, the biophysics department will accept the equivalency. For requirements that are taught by our Biophysics department, the Biophysics DUS will be responsible for this determination, often in consultation with the biophysics professor who teaches the course in question.

7.5 Study Abroad

Biophysics majors can participate in study abroad programs. Because of our upper-level requirements, it is usually easiest for our majors to use the summer term for study abroad. Spending a fall or spring semester abroad is also possible but requires advanced planning. If you are interested in studying abroad, discuss this possibility with your faculty advisor early in your sophomore year to create a plan that enables you to meet the major requirements without overloading your schedule.

7.6 KSAS Requirements

The Jenkins Department of Biophysics is within the Krieger School of Arts & Sciences and follows their general degree guidelines. Therefore, in addition to the major course requirements, an undergraduate degree in biophysics requires:

- Minimum of 120 credits total (this includes credits in the major)

Pre-2024 Admits

- 9 credits of humanities courses
- 9 credits of social science courses
- 12 credits of writing courses

Fall 2024 Admits and later:

- JHU has switched to a ‘Foundational Abilities’ (FA) model. All students must fulfill [minimum credit requirements](#) in each of the 6 FAs.

7.6.1 Writing Course Requirements

Pre-2024 Admits: The Krieger School of Arts & Sciences requires 12 credits total of courses with a “Writing” (or “W”) designation. Although many humanities and social science courses have a writing designation, biophysics majors are also able to fulfill writing credits by taking the courses within the major, which will give them exposure to scientific writing:

AS.250.420	Advanced Seminar Macromolecular Binding
AS.250.383	Molecular Biophysics Laboratory
AS.250.403	Advanced Seminar Bioenergetics
AS.250.411	Advanced Seminar in Structural Biology of Chromatin
AS.250.421	Advanced Seminar in Membrane Protein Structure, Function & Pharmacology
AS.250.253	Protein Engineering and Biochemistry Laboratory
AS.250	Advanced Seminar in Quantitative Cell Biology (B. Camley)
AS.250	Physical Principles of Signal Transduction (Fall) (Quantitative Analysis of Cell Signaling)

Fulfilling the writing credits solely with these biophysics courses requires advanced planning because not all of these courses are offered every year.

Fall 2024 Admits and Later: Students are required to complete **15 credits** of Writing and Communication (W&C) foundational ability coursework. For Biophysics majors, students can fulfill 6 credits within the major coursework by completing AS.250.383, which is a required 3-credit course for the major, and by selecting a designated W&C course as one of their major electives, such as those listed directly above: AS.250.420, AS.250.421, AS.250.411, AS.250.253.

7.6.2 Humanities and Social Science Requirements

It is generally recommended that students spread these courses out over their eight semesters.

7.7 Academic Performance Rules

7.7.1 Minimum Grade Requirements

The biophysics major requires that students earn a grade of “C” or greater for all courses required in the major. A student who earns a grade of “C-” or below must repeat the course and earn a better grade.

The KSAS guidelines on minimum grade requirements apply to all other courses.

7.7.2 Repetition of Course Content

Students earning a grade of C- or less in a course required for the major must repeat the course.

7.7.3 Courses Taken Pass/Fail

KSAS has a policy of allowing students to take courses Pass/Fail if those courses are outside a student’s major.

7.7.4 Double Counting Policy

For the purposes of an additional major (or minor), Johns Hopkins allows students to “double count” the same course. The Jenkins Biophysics department follows this policy. However, we do not allow double-counting within the major. For example, EN.553.311 (Statistics and Probability) cannot simultaneously fulfill the math requirement and the list 2 elective requirement.

7.7.5 Departmental Honors Program

The Jenkins Biophysics department offers outstanding students the opportunity to earn honors in Biophysics. This honors distinction appears on the student’s transcript upon graduation. If the honors requirements are approved prior to April 1 (for Spring graduation), an “Honors” distinction will additionally appear in the commencement program.

The requirements for departmental honors in biophysics can be found in Section 13: Appendix B.

7.7.5.1 Honors Deadlines

May Commencement:

The honors paper must be submitted by the third Monday of March of the senior year to meet the May commencement deadline. See details in Appendix.

December Commencement:

Generally, the honors paper must be submitted by the third Monday of November of the senior year to meet the December commencement deadline. See details in Appendix B.

7.7.6 Ethics in Learning

The Jenkins Biophysics department follows the Johns Hopkins guides for ethics in learning. Violations of academic integrity will not be tolerated and will be handled in accordance with the guidelines established by the Krieger School of Arts and Sciences.

8. MS in Biophysical Chemistry and Design for Biotechnology

The T.C. Jenkins Department of Biophysics offers outstanding undergraduate biophysics majors the opportunity to advance their education through a 10-month M.S. program. Candidates for this program must be current biophysics undergraduates with a departmental GPA of 3.5 or greater and a strong research history. All bachelors' requirements must be completed before matriculating into the master's program.

Information can be found at [Master's Program | Biophysics | Johns Hopkins University](#). If you are interested in pursuing the MS program, please discuss this with your Jenkins advisor or the Master's program directors.

9. No Minor in Biophysics

The Biophysics department does not offer a minor in biophysics.

10. Undergraduate Planning for Professional Schools

10.1 Graduate School Requirements

The biophysics major at Johns Hopkins is an excellent preparation for doctoral studies in a wide variety of fields including pharmacology, computational biology, structural biology, immunology, and of course, biophysics. Section 5.1 shows a typical path to completion of the biophysics major that provides a general preparation for advanced quantitative study. Undergraduates with well-defined graduate interests in specific areas are encouraged to discuss their plans with their faculty advisors to choose appropriate electives. For further advice, [check out Appendix C](#).

10.1.1 Computational Electives

Computational skills are increasingly important for advanced scientific study. In addition to our required Introduction to Computing course, students are encouraged to take more than one of our upper level "List 1" electives that develop computing skills. We do not accept Gateway Java as a list 1 or list 2 as it is 100-level and is redundant with Introduction to Scientific Computing (AS.250.205).

250.302 Modeling the Living Cell

10.1.2 Research Experience

The undergraduate research experience provides essential preparation for graduate research. Although only 3 (or 6) research credits are required, students interested in graduate school should do independent laboratory research for 2 years or more (> 6 credits) to enable them to pursue a scientific problem in a significant manner. In addition to preparing students for graduate research, well-developed undergraduate research experiences make students more

competitive candidates for admission to top graduate programs. [See Appendix C: Are you considering graduate school?](#)

10.2 Considerations for Completion of the Pre-Medical Requirements

There is plenty of room in the academic schedule of a biophysics major to easily meet the pre-medical requirements (see Section 5.2). See [this pre-professional site](#). Though nearly all requirements for medical school can be satisfied by biophysics major requirements, most medical schools require a one-semester laboratory in organic chemistry, which is satisfied by taking AS.030.225 Organic Chemistry Laboratory. In addition, some of the biophysics (and general university) requirements should be tailored to satisfy medical school admissions criteria. These are listed below:

10.2.1 Organic Chemistry Lab

There are several semesters in which “Open” electives must be taken to meet the 12-credit minimum for full-time student status. Pre-medical students are therefore advised to consider Organic Chemistry Laboratory as one of these electives.

10.2.2 College level “biology” course

General Biology is not required for the Biophysics major, does not count towards any of the requirements or electives for the biophysics major, nor is it required for medical school. Though students with no biology background are sometimes recommended a General Biology course by JHU Office of Academic Advising, this is unnecessary for most students.

Biophysics majors can complete the premedical requirement for a year of college level “biology” laboratory with any two of following (required) courses:

250.315	Biochemistry I
250.316	Biochemistry II
250.372	Biophysical Chemistry

10.2.3 College level “biochemistry” or “biology” lab

Biophysics majors complete the premedical requirement for “biochemistry” or “biology” laboratory with the following (required) courses:

Biology course	Paired Lab course
<i>From Biophysics</i> <ul style="list-style-type: none">• Biochemistry I 250.315• Biochemistry II 250.316• Biophysical Chemistry 250.372• Modeling the living cell 250.302• All Advanced Seminars	<i>From Biophysics</i> <ul style="list-style-type: none">• Protein Engineering & Biochemistry Laboratory 250.253• Molecular Biophysics Laboratory 250.383

Biology course	Paired Lab course
<p><i>From Biology</i></p> <ul style="list-style-type: none"> • Genetics 020.303 • Molecular Biology 020.304 • Cell Biology 020.306 • Genetics 020.303 • Developmental Biology 020.363 	<p><i>From Biology</i></p> <ul style="list-style-type: none"> • Cell Biology Lab 020.316 • Developmental Genetics Lab 020.340

10.2.4 Statistics

Biophysics majors meet the pre-medical requirement for a statistics course through one of the following electives which both fulfill the 4th Math requirement:

EN.553.211	Probability & Statistics for the Life Sciences
EN.553.310	Probability & Statistics for the Physical and Information Sciences & Engineering
EN.553.311	Probability & Statistics for the Biological Sciences & Engineering

10.2.5 Sociology/Psychology

Biophysics majors meet the pre-medical requirement for a sociology/psychology course through their KSAS H/S distribution choices.

11. Faculty Contact List

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Course Listings

This manual serves as a guide for undergraduate planning and is only updated once per semester.

The most up-to-date course listings and descriptions can be found in the JHU catalog on line at <https://e-catalogue.jhu.edu/> *in principal. As of April 2026, it is listing requirements for the Fall 2024-2025 admits.*

NOTE: requirements vary for different entry years. Please check stellic.jhu.edu which should be correct for your admit year. If you have questions about this listing, contact your faculty mentor or the DUS for clarification.

Students can also find schedules of classes on **sis.jhu.edu**. Classes for the future semester are only updated midway through the current semester. Because sis only shows classes for 1 year, the Public Class search on the login page can also be used to search multiple years of course offerings.

12. Appendix A: Undergraduate Research Guide for Biophysics Majors

Research Requirements

Independent research is a key component (and a formal requirement) of the Hopkins Biophysics Major. Research is ultimately scheduled as a formal course for credit. However, we encourage students to seek out research labs even if they will do so on a volunteer basis! This is how many students start out or continue to perform research even if it does not ‘fit’ in your schedule due to credit limits. There are no limits to the number of semesters (or hours) you can perform research if you are doing it on a voluntary basis.

Even as a volunteer, it is important to take the research opportunity seriously. This is your chance to find out if the lab is a good fit for your interests. However, it is also a chance for the lab to find out if you are a good fit for them. If you prove to be unreliable at showing up for meetings, putting in effort towards the research, or not taking initiative in furthering your learning and training, the lab is not required to host you for any future research semesters.

Students entering JHU Fall 2024 and later:

The research requirement for the major in biophysics is 3 credits as of Fall 2026 (it was 2 credits for Fall 2024-Spring 2026), by taking the course AS.250.520, entitled “Introduction to Biophysics Research”. This course is not given a letter grade but is taken S/U. **Students can register for between 1 and 3 credits.** Students are encouraged to pursue research beyond the 3-credit requirement as their time and schedule allows. Grad/med schools evaluate research progress, success, and rec letters, not the number of credits you take.

If you entered in Fall 2024 or Fall 2025 specifically, you were officially required to complete only 2 credits of research. We encourage you to complete 3 credits (minimum) anyways. It is better aligned with the philosophy of our major to promote independent research, and it is also more appealing to research mentors to show higher commitment to research.

Students entering JHU before Fall 2024

The research requirement for the major in biophysics is 6 credits, by taking two semesters of the course AS.250.520, entitled “Introduction to Biophysics Research”. This six-credit sequence is not given a letter grade but is taken S/U. After completing this sequence, students are encouraged to continue their research, enrolling in the course AS.250.521 entitled “Research in Biophysics”. Because students will have achieved proficiency in independent research from their first year of research, they can take AS.250.521 for a letter grade, for up to six credits per year. Each of these two courses are offered in the fall, spring, and summer terms. Note that research during Intersession is not accepted for credit.

Research during intersession is not accepted to meet the Biophysics major requirements.

Research Philosophy

The undergraduate biophysics research experience is an apprenticeship in which majors engage in guided but independent research Johns Hopkins research laboratories. To initiate this apprenticeship, students must search for and initiate a relationship with a “Research Supervisor” who is willing to work directly with the student.

In the initial phase, which may last for as long as a semester, the student may simply learn techniques, become familiar with the research problem and relevant literature and learn and understand the questions and goals of the overall research project. By the second semester, the student is expected to become a semi-independent researcher able to perform experiments and come up with improvements in procedures and experimental design. The first year of research (AS.250.520) must be taken S/U. Beyond 6 credits (AS.250.521), research will be graded based on the student's performance (see the rubric below). Although productivity in the first semester of research will likely be low, effort should be constant. As described above, an average of 10–12 hours of active, engaged research over the 13-week semester is required for 3 credits of research. This does not include being in the lab but browsing the internet or social media while a column or simulation runs.

By the end of 6-credits (or the comparable time-commitment), most students are able to obtain publishable data. Many students who complete more than this amount of biophysics research become co-authors of abstracts and papers published with their Research Supervisor. Thus, it is strongly encouraged that students participate in research for two or more years. Students and Supervisors both benefit from the extended training, and are more likely to make significant discoveries in their second year of research. Along these lines, students are encouraged *NOT* to switch labs from semester to semester, but rather to pursue one research project during their time at Hopkins.

[When to add research to your schedule](#)

It is a good idea to start thinking about undergraduate research as a freshman or sophomore. Many students who enter JHU with AP credits start their research projects early their sophomore year, but starting in your junior year is also fine. Although it is permitted, waiting until senior year to start research is strongly discouraged.

[“Research Supervisor” versus “Faculty Sponsor”](#)

The “Research Supervisor” is defined as the head of the laboratory in which you carry out your research.

The “Faculty Sponsor” must be a full-time faculty member in the Jenkins Department of Biophysics. This will normally be your academic advisor in the Biophysics department. In your second year and beyond, your sponsor will assign your research grade in close consultation with your Research Supervisor. You must register for the Biophysics research using the section number of your Faculty Sponsor.

The Jenkins Faculty Sponsor must be confident that the Research Supervisor is qualified for and committed to this apprenticeship program. The Research Supervisor must be able and willing to observe and evaluate the performance of the student. Moreover, the research topic should be appropriate to the biophysics major, broadly defined.

If you are conducting research under the supervision of a full-time faculty member in the Jenkins Department of Biophysics, that person can also serve as your “Faculty Sponsor.”

Biophysics research topics and locations

The Biophysics major allows undergraduate research experiences in a broad range of topics; however clinical research and survey-type investigations are not allowed. With these restrictions in mind, students can initiate an apprenticeship with a Research Supervisor in any laboratory in Arts and Sciences, Medicine, Engineering and Public Health. A vigorous and wide-ranging search for potential Research Supervisors is the best way to ensure a successful apprenticeship. Repetitive tasks that require little or no initiative or intellectual input from the student, such as plate scoring or bottle washing, do not, by themselves, constitute a suitable research apprenticeship. Rather, research activities by the student must directly test a hypothesis or enhance our understanding of a specific area of science.

Labs outside of JHU

Students can be approved to perform summer research for credit at a lab outside of JHU. The research must fulfill the same criteria as JHU research (no clinical or survey-based research). Students cannot receive credit if they are participating in an internship or otherwise being financially supported by the research supervisor. The research supervisor must be an MD or PhD who agrees to evaluate the student (and not a parent/family member), and the research must be taken S/U.

Four steps to find a research position at JHU

1. Find out what research interests you that is being carried out at JHU.

Follow your natural interests in searching the JHU web pages of science faculty. The web pages for the [Jenkins Biophysics Department](#) and the [Graduate Program in Biophysics](#) are both good places to start.

As you read faculty research descriptions, you may come across a topic that caught your interest in a previous class or a technique that just sounds cool. Your faculty advisor can help direct you to research labs that match your interests. Do not hesitate to ask them for advice, as your advisor may have insight from previous undergraduate research experiences that you may not be able to identify from published and/or posted material.

Once you have identified two or three labs that interest you, download a paper or two from those labs and familiarize yourself with the scientific questions being addressed as well as the techniques that are employed.

2. Contact faculty members.

As soon as you have identified a research lab that interests you, send an email to the faculty member in charge, inquiring whether he or she has an opening. Since the process of identifying a lab and a research project takes a lot of effort on both sides, it is *strongly advised* that you make faculty contacts the semester *prior* to when you want to start research. It is important in this first contact to introduce yourself to faculty members with a thoughtful paragraph: tell them about yourself (courses you have taken, any previous research experience, your long-term goals), and state why you are interested in his or her lab. Be prepared to send a short resume, transcript,

or recommendation from an instructor or TA. If the faculty member is interested, make an appointment to discuss potential research projects. Since most faculty have busy schedules, you will have the best luck making an appointment by providing the faculty member with a readable, formatted table letting them know all the times you are available to meet during the week, rather than asking “when can you meet.”

3. Register for research.

Log into SIS. Under the Registration menu, click on Online Forms. Select Independent Academic Work. Complete the form, providing full explanations where needed, and submit it. The form will be sent to your faculty sponsor for approval. Once the sponsor approves it, you will see the position/ project in your Confirmed Enrollment screen in SIS.

Students are limited to *six total credits per academic year*. This may involve two one-semester three-credit courses (course numbers listed above), taken in the fall, winter, or summer. A maximum of three credits may be taken in any of these three terms. Fewer credits may be taken, although this is not advised, since most research projects require a “critical mass” of effort by the student.

*Note that the six-credit limit per year of research is strictly enforced by the registrar’s office. The registrar’s academic year starts with the **summer** semester. If you earn 3 research credits in the summer and 3 in the fall, you are not eligible to earn additional research credits in the spring.*

4. At the beginning of each semester:

The student and the Research Supervisor must complete **PART 1** of the “**Supervisor’s Report for Independent Research in Biophysics**” (included below) before the end of the second week of the semester (the Add deadline), and give the completed form to their research sponsor (usually their academic advisor in the Biophysics department).

5. At the end of each semester:

The student completes one of the course requirements as described below:

5A. If the student is completing their first semester of research (e.g. the student has a total of 3 or less research credits):

- The student is required to write a 2–3 page **Progress Report** and submit this to the Research Supervisor for grading.
- Upon receipt of the Progress Report, the Research Supervisor completes **PART 2 of “Supervisor’s Report for Independent Research in Biophysics”** (included below).
- The student delivers the Progress Report and the completed Supervisor’s Report to the Faculty Sponsor. The Faculty Sponsor must receive ALL of this material by the end of the final exam period.

- Prior to submitting the grade and credits to the Registrar, the Faculty Sponsor may consult with the Research Supervisor to confirm that the assigned grade (S/U) matches the effort and accomplishments made by the student.
- Guidelines for how to write a Progress Report are provided on page 5 of this handout.

5B. If the student is completing their second (and all subsequent) semesters of research (for a total of six or more research credits):

- The student should prepare a poster or a series of PowerPoint slides that provide a self-contained description of the research, including introduction and hypothesis, methods, results, conclusions, and literature cited, and submit this to both the Research Supervisor and Faculty Sponsor for grading, as described above.
- Upon receipt of the Poster, the Research Supervisor completes **PART 2 of “Supervisor’s Report for Independent Research in Biophysics”** (included below). The supervisor must meet with the student to discuss the report, including any deficiencies or areas that need improvement, and plans for the upcoming semester of research, and also discuss the poster/PowerPoint slides.
- The student then delivers the Poster and the completed Supervisor’s Report to the Faculty Sponsor before the end of the final exam period. **Graduating seniors in their terminal semester should note that they risk losing their “graduating” status for that commencement period if they miss this deadline. This is a hard deadline established by the Registrar.**
- Prior to submitting the grade and credits to the Registrar, the Faculty Sponsor may consult with the Research Supervisor to confirm that the assigned grade (S/U or letter for AS250.521) matches the effort and accomplishments made by the student.
- Guidelines describing how to prepare a poster are provided on page 13 of this handout.

6. Grading:

Research done to fulfill AS.250.520 (year 1) is graded S/U, whereas research done to fulfill AS.250.521 is given a letter grade (eligible after 6 credits of 250.520) The Faculty Sponsor will submit a research grade online upon receipt of the following:

The Progress Report or Poster; and

The “Supervisor's Report for Independent Research in Biophysics” Part 2

SUPERVISOR'S REPORT FOR INDEPENDENT RESEARCH IN BIOPHYSICS

PART 1. To be completed by the RESEARCH SUPERVISOR and STUDENT at the START of the semester.

Independent research is a key component of the Biophysics Major. Student research involves significant independent effort in the laboratory. Students must work ten hours per week in the lab (at a minimum) to receive three credits during a full (fall or spring) semester. As the summer period is shorter, summer research is expected to involve a proportionately greater effort per week, so that the total effort matches that for the fall / spring semester. By signing below, we (Student and Supervisor) agree to this effort level in the coming semester:

Student signature _____ Date: _____

Supervisor signature _____ Date: _____

Student: return a COPY of PART 2 this form (next page) to your Jenkins Faculty Sponsor in biophysics prior to the drop/add deadline of the current semester. Part 2, on the next page, must be filled out by your Supervisor and returned to your biophysics sponsor *before the end of finals, along with your written Progress Report or Poster (see above for details on the Progress Report or Poster)*.

SUPERVISOR'S REPORT FOR INDEPENDENT RESEARCH IN BIOPHYSICS

PART 2. To be completed by the RESEARCH SUPERVISOR at the END of the SEMESTER.

Student/HopkinsID _____ / _____ Term _____

Biophysics Faculty Sponsor _____

Research Supervisor _____

Course number (circle one): AS.250.520 (year 1) AS.250.523 (year 2+)

Supervisor: In the space below and on the back, describe the research accomplishments made by the student in the last semester and its significance. Also, comment on level of effort made by the student, their proficiency level, and any areas where the student can make improvements. Then fill out the check boxes at the bottom

	EXCELLEN T	VERY GOOD	SATISFACTOR Y	NEEDS IMPROVEMEN T	UNSATISFACTOR Y
ATTENDANCE					
UNDERSTANDING SCIENTIFIC BACKGROUND					
TIME MANAGEMENT					
EXPERIMENTAL SKILLS					
PRODUCTIVITY					
RECORD KEEPING					
VERBAL SCIENTIFIC COMMUNICATION					
WRITTEN SCIENTIFIC COMMUNICATION					
DEMONSTRATE INITIATIVE					
OVERALL					

Significance of the research:

Progress made this semester:

Plans for the coming semester:

Areas that need improvement:

SUGGESTED GRADE _____ CREDITS _____

SUPERVISOR'S SIGNATURE _____

Student: return a COPY of PART 2 of this form to your research sponsor in biophysics prior to the end of finals week, along with the written component (i.e., your Research Report or Poster; see above).

Progress Report Guidelines

The Progress Report should include:

- The Student's name, the Research Supervisor's name, his/her title and affiliation, student's name, when accomplished e.g., Fall 2022, Spring 2023, Summer 2023.
- **Introduction:** Background rationale with reference/s; how the work fits into the overall objectives of the research program.
- **Methods:** Briefly give techniques used.
- **Results:** Give results obtained. If too early in the project for results, more on methodology might be appropriate.
- **Discussion:** Significance of results and their relation to future plans.

Poster Preparation Guidelines

Supervisors may have specific instructions or styles for laboratory posters, but a general guide for approaching this task is to prepare 9 OR 12 letter-sized (8.5 × 11 in) power point slides as following:

- **Title:** (1 slide) This slide contains the title of your study along with your name and the name of your Research Supervisor and when the work was accomplished, e.g., Fall 2022, Spring 2023, etc.
- **Abstract:** (1 Slide) This is essentially one paragraph that outlines the question that was addressed, summarizes the main results and states the conclusions. Do not use a font size smaller than 18.
- **Introduction:** (1 Slide) *This slide is optional.* You may choose to include it if you feel that your Abstract does not adequately describe the background for your project. Do not use a font size smaller than 18.
- **Results:** (5 or 8 Slides) Provide figures or graphs of data. Each result should have a scientific title that summarizes the main finding as well as a figure legend that briefly describes the methods. Do not use a font size smaller than 18.
- **Conclusions:** (1 Slide) A bullet point list of the main conclusions of the work. This section also contains a reference to the funding source for the work. A brief description of future experiments may also be appropriate in the Conclusions section. Do not use a font size smaller than 18.
- You must submit both paper and electronic copies of your poster to your Jenkins Faculty Advisor.

Frequently Asked Questions about Graded Research in Biophysics & the Biophysics Poster Session (BURF):

What time commitment is expected for research?

A general guideline is that 1 credit equals 3–4 hours laboratory work per week during the semester. An absolute minimum effort of 10 hours per week is expected for 3 credits of research. As the research progresses, students often find that they want to work more hours in the laboratory so that they can get more done. We encourage this, but cannot award more than three credits per semester, and six credits per academic year. Note that the level of effort should be evenly maintained throughout the semester.

Is research after 6 credits (AS.250.521) a guaranteed grade of “A”?

No. For the graded research course, it is like any other graded course, where “grades” necessarily have more than one value. Thus, you should take it seriously, like all your other classes. At a minimum, you should be committing 10–12 hours per week for 3 credits of research. However, simply showing up for this many hours will not guarantee a grade of “A.” You want to show interest and initiative with your project; you want to ask lots of questions, and make progress in gaining technical skills, optimizing methods, acquiring knowledge, and making discoveries.

If I do research for one semester in a lab, am I guaranteed a spot in their lab for subsequent semesters?

No. Research is a partnership between the undergraduate students and their research mentors, including the faculty supervisor. If you, the student, would like to try other research topics, you are perfectly allowed to seek out other labs. Similarly, if the mentors decide that this partnership is not working out, they do not have to host your continuing research. The primary reason for this is attendance, initiative, effort, and accountability. If you are missing meetings, failing to communicate with your mentors, or putting in minimal effort, the mentors may decide they would rather find another student to train.

My Progress Report is longer than 3 pages. Is this a problem?

A Progress Report longer than 3 pages is generally not a problem. If you have questions about what to include, you should seek the advice of your Faculty Sponsor.

What is the Biophysics Undergraduate Research Festival (BURF)?

Biophysics Undergraduate Research Festival takes place in April of each year. The event is usually held at Mudd hall lounge area. Every Biophysics major or freshman who is interested in learning about Biophysics is invited. The first hour is a poster session in which all Biophysics undergraduate students who are engaged in research present a poster that is viewed by faculty and students in the department. The poster session is followed by a 45-min long research symposium (generally in 100 Mudd Hall) in which we have presentations (10–15 minute talks)

given by three to four selected graduating seniors on their research progress. Afterwards, we share food, drinks and fellowship in the Mudd lounge.

I have only completed 3 credits of research, but it went really well, and I was able to collect a lot of cool data. I want to make a poster and participate in BURF. Am I allowed?

Congratulations on your early success in the lab! During your first semester of research, you will still need to write your paper for your grade, but of course you are welcome to prepare a poster and participate in BURF. You should have both your Research Supervisor and your Faculty Sponsor approve your poster.

I did research in the fall (or previous summer) but not in the spring. Can I still participate in the poster session?

Yes, even if you conducted your research in the fall (or previous summer) but did not continue through the spring, you are still invited to present your poster in BURF. In fact, we encourage you to participate. Keep in mind that you should have submitted both paper and electronic copies of your poster to your Jenkins Faculty Sponsor during the semester you conducted research for a grade. Thus, printing your submitted poster for the spring BURF should only require some file formatting.

Am I required to participate in BURF?

Yes, **if** you are applying for honors, then participation in BURF is required.

No, if not. Since our poster session will be held annually, it is not a course requirement per se, and participation will not be graded. However, it is **highly recommended** that you participate in BURF for as many years as you can. A poster session is a valuable opportunity for you to present your work to the faculty and to your peers. It will allow faculty to get to know you better, see what kind of researcher you have become, and in general, write stronger letters of recommendation on your behalf. It can also be added to your CV.

I will be seeking Honors in Biophysics. Does the poster take the place of the Honors Paper?

No, the requirements for Honors in Biophysics are found in this very Manual in Appendix B.

Participation in a BURF is a requirement (in addition to the Honors Thesis) for majors seeking to earn Honors in Biophysics.

13. Appendix B: Departmental Honors in Biophysics

The honors distinction appears on the student's transcript upon graduation, on the commencement lists, and permanently on your CV. It also produces a final 'product', the thesis, that showcases your research accomplishments during the undergraduate years.

13.1 Eligibility

Students who have met the requirements for the Biophysics major and who satisfy the following requirements are eligible for departmental honors at graduation:

- Overall GPA 3.5 or better
- "Honors Thesis" in Biophysics approved in writing by the student's *Research Supervisor* and *Faculty Sponsor* and conforming to the attached guidelines.
- Participate in at least 1 BURF event.

To evaluate if you are eligible:

- Determine your overall GPA.
- Consult with your research advisor about writing a paper describing your research project at the beginning of your final semester.
- Contact the DUS for Biophysics (Prof Margaret Johnson) to declare your intent to pursue honors.

13.2 Honors Paper

The honors paper must describe independent research carried out by student as part of biophysics research requirement (250.520/521). Library research is not acceptable for this purpose. The length should be ~20 pages double-spaced, plus figures and literature citations. The format should follow the layout of a research paper; a guide for each section is given below.

13.2.1 Honors Paper Layout

Abstract (250 words, no longer)

A typical abstract typically contains one sentence describing the problem, one sentence describing its significance, one sentence describing the approach, and two-three sentences stating the results and conclusions.

Introduction (~4–6 pages)

Provide background information necessary to understand the study undertaken. Be sure to state why the problem you addressed is important as well as how your research relates to previous work. Assume that your reader is another undergraduate biophysics major with some scientific training but who does not work in the same lab. Your goal is to provide sufficient information for such a reader to understand and appreciate your project, but nothing extraneous.

Materials and Methods (~2–3 pages)

Describe your experimental protocols, and state where you obtained reagents. There should be enough detail to allow an independent researcher to reproduce your experiments. Since the methods section describes the experiments that you have already done, it should be written in the past tense.

Results (~4–10 pages)

Provide a narrative that describes the outcome of the experiments performed. Figures documenting the results should be accompanied by legends that enable the reader to understand what is in the figure. It is preferable if the figures are imbedded in the text, but they can also be placed together at the end of the paper. The space taken by figures is not counted in the page limit of the paper. The results section should be written in the past tense.

Discussion (~4 pages)

Discuss what was learned, the reliability of the results, any limitations to the interpretation, significance of your conclusions, future directions.

Literature references

These must follow the format of a standard journal in the field, such as *Biophysical Journal*, *Protein Science*, *Nature Structural Biology*, *Nucleic Acids Research*, etc. Take care to include references to the primary literature, not just review articles or textbooks. Your paper should represent a scholarly effort. In general, any time you report a specific scientific finding or restate a specific idea or thesis, the author of the experiments or the idea should be cited. The citation of a timely review article can support general statements that refer to a collection of phenomena. Your research advisor can direct you to the best literature sources in the area of your research project. The citations should be placed in a list at the end of the paper (endnotes rather than footnotes). Citations can either be numbered in order of appeared in the main text, or marked by Author, year in the main text and listed alphabetically in the reference section.

13.2.2 Honors Paper Due Date

For a May commencement, the honors distinction is due to the Registrar's Office by the DUS in late March (Spring) or mid-November (Fall). To meet that deadline, the following is the timeline for completing the paper requirements:

- Contact the Biophysics Director of Undergraduate Studies (DUS), currently Prof Margaret Johnson at the beginning of the semester when you are graduating. Notify the DUS that you intend to pursue departmental honors: the Biophysics DUS is the person responsible for submitting your name to the registrar.
- Discuss and receive approval from the faculty that is supervising your research that you will write the honors thesis. They need to know the deadline of when you will submit the completed draft to them, and they need to know that they are expected to email approval to the DUS. Do this at the beginning of the semester.

- Submit a 20-page honors thesis draft to your Research supervisor (who is a faculty member). When you submit the draft (via email) to your supervisor, you **must** cc the DUS. Also include your Biophysics faculty advisor. Below are **HARD** deadlines.
 - **Spring deadline: 3rd Monday in March.**
 - **Fall deadline: 3rd Monday in November**
- Your Research Supervisor is expected to read the thesis draft and give you feedback, hence they need to be notified of this in advance, by you. You must revise according to their feedback, until they give final approval for the final, polished version of the thesis!
- Ask both your *Research Supervisor* and your *Faculty Sponsor* to send an email to the Biophysics DUS indicating their approval of the paper, as soon as they approve it. This should be no later than April 8 (spring) or Nov 28 (fall). It is fine to have them send a simple email sent directly to the DUS stating, “I approve the honors paper written by xx student entitled “Your fabulous title.”” The DUS controls the approval for departmental honors directly to the registrar.

The latest time to set up an appointment with your *Research Supervisor* to discuss the honors paper should be early February for May graduation, and early October for December graduation.

14. Appendix C: Are you considering graduate school?

Resources – your professors!

All faculty in the biophysics department attended graduate school for their PhD. Aside from the MDs at the School of Medicine, that will typically be true of all your professors. We are also members of at least one Graduate program at JHU, and excepting perhaps the newest faculty, we are familiar with the admissions requirements for graduate programs and the expectations of the most competitive programs. Not everyone will give you the exact same advice, but there is some generally agreed upon wisdom.

Undergraduate Research is critical

Nowadays this is an essential prerequisite for graduate studies. Performing undergrad research demonstrates your interest and motivation to pursue graduate research. With research, you address problems that have not yet been solved, whereas in course work you learn to solve problems where the answer is already known. Research presents new challenges, including figuring out exactly what is the specific and narrowly-defined problem/question you will address with your approach, and how this connects to a larger hypothesis about your project. With research you learn what is known in a field, and what is not known and represents an active direction of research.

The more semesters you spend doing research, the easier it is to convince graduate programs that you are committed to graduate research. Finding the best undergrad research lab for you may mean moving to more than one lab. The benefit is that this exposes you to more fields or approaches (e.g., experiment vs theory or computation, single-molecule measurements vs cryoEM, etc.), and more mentorship styles. The downside is that you make less progress and establish less independence on a single research project. While it is good to switch to a new lab to find the fields that excite and inspire you, do this early. It is important to balance new experience with sustained progress on one project. The PI will get to know you better, and the deeper you get into a project the better you can appreciate the challenges and joys that accompany problem-solving in independent research. You will also be much more likely to co-author a paper, which is always a strength.

Summer internships are positively viewed. They demonstrate that you pursued/applied to a competitive program and relocated to a new environment to further your research interests. JHU has internal undergraduate research awards (PURA) open to all undergrads. These are **highly** competitive, so you often have to apply more than once to improve your chances of award.

Course work shows off your interests and study skills

Perfect GPAs are not a requirement for graduate school. A strong GPA does signal to the committee that you have good time-management, study habits, work ethic, and intellectual aptitude for succeeding in graduate/advanced course work. A low GPA is thus a red flag. Course work/major also reflects your interests. Biophysics is inherently interdisciplinary and quantitative, which is generally a strength when applying to natural sciences programs. It is worth noting that Engineering PhD programs tend to prefer students with degrees in engineering, as the course load is more quantitative, but this is hardly exclusive. Courses and research you

pursue as an undergraduate Biophysics major can demonstrate a good fit to engineering degrees. Physics programs similarly tend to select for undergraduate physics majors, particularly given the more rigid, less interdisciplinary course requirements of Physics PhD programs.

Recommendation Letters should come from faculty knowledgeable about you

You will need recommendation letters from 3 professors. You ideally want faculty who know you well and can make insightful and specific comments about your critical thinking and problem-solving skills, independence, leadership, research record, academic excellence, and writing/communication skills. The more they can say about you, typically, the stronger the letter. Professors who have supervised your research efforts are the most important letter writers, because they have the best sense of how you are progressing and growing as an independent scientist (everyone has a first research experience somewhere, usually as an undergrad!).

Applicant Statements help communicate your motivation and interests

These statements are your chance to communicate your motivation for choosing graduate school and the scientific fields or approaches that excite or intrigue you. Attending a PhD program because you want to keep taking classes or because you are not sure what else to do is not a compelling reason for admission. Scientific research requires dedication to a years-long project, well after your coursework ends. It requires hard work, perseverance, and your own driving motivation. The payoff is that you contribute something brand new, whether ideas, methods, or products, that further humanity's scientific understanding of the world.

15. Appendix D: Undergraduate Awards

Awards for Biophysics Majors

These awards recognize excellence in academics and/or research for graduating Biophysics majors, or provide travel support for current undergraduates to a conference. JHU also offers awards for current undergraduate students, like the PURA, that are not restricted to Biophysics students.

Szuts travel award:

Eligibility: All biophysics majors. Application is required to the DUS, with approval from your research supervisor. This award is limited to students who will attend a conference along with a Jenkins faculty member. This is a restriction of the funding source.

Detlev Bronk award:

Eligibility: Graduating biophysics majors only. This award recognizes academic excellence. GPA plays a major role in selection of the Bronk award, but it cannot be the only factor, as a large fraction of our graduating students have a GPA > 3.9, including sometimes several 4.0s. The faculty select 1-2 awardees per year who have gone 'above and beyond'. Beyond GPA, academic excellence can further be reflected in course loads, number of credits taken, A+s, and finally, the feedback of faculty on course performance that exceeds numerical scoring.

H. Keffer Hartline award:

Eligibility: Graduating biophysics majors only. The Hartline award recognizes undergraduate research excellence. To be eligible, students must have participated in at least one BURF/Poster session, and they must submit an Honors thesis (see Appendix B.). Students who submit an Honors thesis will be automatically considered for the award. Faculty will select 1-2 awardees based on research excellence. This can include (but is not limited to) commitment to research throughout undergraduate education, research supervisor reports/feedback, and participation in research events.

16. Appendix E: History of Jenkins Biophysics

The Biophysics Department was established with funds from Mrs. May McShane Jenkins and named in honor of her late husband Thomas Courtenay Jenkins (1866-1938), a Baltimore financier and art collector. Mrs. Jenkins was always interested in physiotherapy. Her eagerness (as her will stated) to encourage exploration of “water, heat, and light in the treatment of disease” led Mrs. Jenkins to make donations in 1947 and 1955 for the study of biophysics at Johns Hopkins. Upon her death in 1957 the University received the bulk of her estate to endow the Thomas C. Jenkins Department of Biophysics. A final distribution took place in 2000.

In 1949, the first course in biophysics was offered at Johns Hopkins. The following year Jenkins Hall was dedicated as the center of biophysical research at the Homewood campus. In 1953, the first Chairman of Biophysics Dr. F. Keffer Hartline (1967 Nobel Prize winner in Physiology or Medicine) left the University and was replaced the following year by Dr. Francis “Spike” Carlson, who was part of the faculty group to start biophysics here. He served until 1971. Under his leadership in 1956 “fundamental studies” in biophysics was formally established as the separate Thomas C. Jenkins Department of Biophysics in the Faculty of Philosophy (the predecessor of the School of Arts and Sciences). Medicine and health studies in biophysics were placed under the Schools of Medicine and Public Health, respectively. Jenkins Hall was expanded to its current size three years later. Dr. Carlson was succeeded as Chairman by Dr. Warner Love (1971-74); Dr. Michael Beer (1974-80); Dr. Warner Love again (1980-83); Dr. Shin Lin (1983-96); Dr. Eaton E. Lattman (1996-2004); Dr. George Rose (2004-2007); and Dr. Bertrand Garcia-Moreno (2007-2020). The current Chair is Dr. Douglas Barrick (2020-Present).

In accepting Mrs. Jenkins’s 1957 bequest, Dr. Milton S. Eisenhower, then President of Johns Hopkins, explained the significance of biophysics:

The interrelation of biology and physics is an important field of study. There are few investigators with the thorough training of both biology and physics, who can do advanced work in the combined biophysics field. Johns Hopkins is performing a unique service in producing investigators who are capable of advancing biology in terms of physics and mathematics.

In that spirit, this Department always seeks to be a center of fundamental biophysical studies. Faculty members from other disciplines who are oriented towards biophysics receive joint appointments. We are very much involved in the Program in Molecular Biophysics (PMB). In the mid 1980s, Jenkins Hall was completely renovated, allowing us to easily take advantage of the burgeoning use of computers and other new technologies. This permitted the installation of a University-run computer lab. The building has been upgraded several times, most recently in 2014.