

Biophysics, BS

Biophysics combines core knowledge from physics, chemistry and biology to understand the systems in living organisms. It must be declared by the end of your first year.

Biophysics students learn about the structures and mechanisms of living systems at the chemical, molecular, atomic and electronic levels and become familiar with the techniques and instrumentation with which to study these. The Biophysics major is a rigorous preparation for a career in medicine or in the rapidly growing biomedical industry, or for further study and research in biophysical and biomedical sciences.

Degree Requirements

The College of Arts and Sciences curricular requirements are organized around these essential components:

- The development of fundamental skills of critical inquiry, analysis and expression.
- The development of appreciation for the spiritual and creative dimensions of human life and culture.
- The development of a responsible commitment to the broader social and political communities in which we live.

The college challenges students to embrace, seek to understand and engage actively in the complexities of the world in which we live. Courses in the Marquette Core Curriculum (MCC), drawn from the different disciplines within the humanities, natural sciences and social sciences, provide multiple perspectives and methods of inquiry. The MCC serves as the foundation for the intellectual growth of our students as they pursue their majors and professional disciplines, and as they develop into men and women who dedicate their lives to the service of others.

Courses in the majors provide in depth knowledge and skills concerning a particular area of study. The college offers a wide variety of discipline-based majors in the Humanities (English, History, Philosophy, Theology and Languages, Literatures and Cultures); in the Social Sciences (Anthropology, Criminology and Law, Economics, Political Science, Psychology, Sociology and Social Welfare and Justice); and in the Sciences (Biology, Chemistry, Physics, Math, Statistics and Computer Science). In addition, a wide range of majors and minors are offered in interdisciplinary areas of study including Africana Studies, Bioinformatics, Cognitive Science and Gender and Sexualities Studies, among others.

The combination of courses required by the Marquette Core Curriculum and individual majors in the College of Arts and Sciences ensures that students are educated both broadly and deeply, in keeping with long-standing Jesuit educational ideals and principles.

First-Year Seminar

Students are required to complete ARSC 1953 Exploring Arts and Sciences during the fall term of their first year at Marquette. Students in the Honors Program are exempt from this requirement. Advanced standing transfer students who have completed a similar course at another institution may ask the college to waive the requirement.

Bulletin Year and Degree Audit

Undergraduate students must meet the graduation requirements that are outlined in the Undergraduate Bulletin in effect the year in which they enter Marquette. Substitutions or waivers for specific courses that are required for degree completion may occur, as determined by the Klingler College of Arts and Sciences.

Students who interrupt their enrollment from the university follow the degree requirements from the bulletin in effect during the academic year of their readmission. In rare cases, the college may determine that readmitted students fall under a different set of degree requirements than the academic year in which they are readmitted. Policies and regulations in effect at the time of return apply to all students, regardless of the term of initial enrollment.

It is the responsibility of students to know and fulfill the requirements for graduation specified for the selected plan. Students are encouraged to use the Academic Advisement degree audit system, which is accessed via their Student Center and tracks courses that have been completed, as well as the Marquette Core Curriculum, college curricular requirements and major/minor requirements toward degree completion.

Grade Point

- Earn a minimum grade point average of 2.000 for graduation.
- Achieve a 2.000 grade point average in all courses in the major or minor.

Credit Hours

Complete a minimum of 32 credit hours in upper-division Marquette courses (lower-division courses are numbered 1000 to 2999; upper-division courses are numbered 3000 and above).

Other Requirements for Graduation

- Complete the formal online application for graduation available in the CheckMarq Student Center (<https://checkmarq.mu.edu/>), by the specific term deadlines for application, as published in the Academic Calendar (<https://bulletin.marquette.edu/undergrad/academiccalendar/>).
- The college adheres to the University Commencement Policy (<https://bulletin.marquette.edu/policies/commencement/>).

Although most students can fulfill the Marquette Core Curriculum requirements, the college curricular requirements, their major requirements and elective courses without exceeding 120 credits, certain combinations of major and minor fields may require more than the minimum. Students are urged, therefore, to consult an adviser before selecting a major and any additional majors or minors.

It is the responsibility of students to know and to fulfill all university, Klingler College of Arts and Sciences and major department requirements (See the corresponding sections of this bulletin for additional information regarding the Marquette Core Curriculum, university graduation and residency requirements, college curricular requirements and department major and minor requirements).

University Graduation Requirement

Undergraduate Graduation Policy

Students are required to graduate at the end of the term in which all degree requirements are completed. Degree requirements are those requirements, including university, college and all other requirements necessary to earn a minimum of one undergraduate degree and any declared degrees/majors/minors/concentrations. That is, additional degrees/majors/minors/concentrations may be earned; however, they must be completed in the same term as the first degree/primary major is completed. Except in the case of readmission, undergraduate students must meet the graduation requirements which are stated in the Undergraduate Bulletin issued for the year in which they entered Marquette. Substitutions or waivers for specific courses required for degree completion may occur, as determined by the college and/or the Marquette Core Curriculum committee.

Students who have interrupted their enrollment from the university, are normally obliged to follow the degree/major/minor/concentration requirements in effect at the time of readmission. Policies that are in effect at the time of the return, apply to all students, regardless of the term of initial enrollment. Students are responsible for keeping themselves informed of the requirements which apply in their particular cases. Students have faculty advisers available who assist in planning and implementing their plan of studies; however, it is ultimately each student's responsibility to know and fulfill the requirements for graduation specified for the selected plan. This should be done not only by utilization of specific advisers, but also with Academic Advisement, the university's online degree audit tool on CheckMarq provided to all undergraduates. With Academic Advisement, students track their degree progress until graduation. It is the responsibility of students to immediately bring any discrepancies found in Academic Advisement to the attention of their college.

A candidate for a baccalaureate degree must meet the following graduation requirements:

1. In all undergraduate colleges and programs, a minimum of 120 credits earned and a cumulative grade point average of 2.000 is required for a Marquette undergraduate degree.
2. Credits required to be completed in residence at Marquette:
 - a. A minimum of 45 total credits must be completed at Marquette. Up to 15 of the 45 credits may be completed through an approved study abroad program.
 - b. A minimum of 32 upper-division credits must be completed at Marquette. This may include upper-division credits from an approved study abroad program.
 - c. The final 30 credits needed to complete a Marquette undergraduate degree must be completed at Marquette, unless those credits are earned in an approved study abroad program, or are earned as part of a written/contractual agreement with another institution, in which Marquette students participate during the final year of their degree program.
 - d. A minimum of one-half of credits in the major, minor, and concentration not attached to a major must be completed at Marquette.
3. Students must attend all courses, lectures, or any other exercises that are required, even though, in some cases such activities receive no recognition in terms of credit hours.
4. Students' records must be cleared of all grades that are not permanent, i.e., grades of I, IC, IE and NG.
5. Students must file the online application for a degree by the deadline published in the Academic Calendar (<https://www.marquette.edu/central/registrar/calendars-exams-schedules.php>); however, because students are required to graduate at the end of the term in which all university, degree requirements are complete, the university reserves the right to graduate a student without a graduation application on file. If the university exercises this option, there is no guarantee students will be able to participate in Commencement.
6. Commencement is held in May, after the spring term. Participation in Commencement does not mean students are graduated. See the Commencement Policy (<https://bulletin.marquette.edu/policies/commencement/>) in this section for further details.
7. Exceptions to this Graduation Requirements policy must be approved by the Office of the Provost, except:
 - the course and bulletin year exceptions listed in the 'Graduation Requirements' section above (as approved by the college)
 - number 3 above (as approved by the college)
 - the dean's office in the college where the student's program resides may exempt up to 6 of the final 30 credits from being completed in residence (number 2c above)

For additional college requirements, consult the Degree Requirements listed for each undergraduate program in this bulletin.

Special Note for 2023-2024: Students who attended Cardinal Stritch University in a bachelor's degree program during the 2022-2023 year and directly transfer to a bachelor's degree program at Marquette University in Fall 2023 or Spring 2024 with fewer than 45 credits remaining in their Marquette program are exempted from the standard Marquette residency requirement (items 2-6 listed above). In lieu of the standard residency requirement, exempted students must complete all remaining credits for their undergraduate degree at Marquette. Exempted students are expected to remain continuously enrolled (fall and spring terms) at Marquette until the completion of their bachelor's degree.

Graduation Latin Honors

The grade point average is used to compute graduation Latin honors. The computation is made by dividing the total number of grade points earned at Marquette University by the total number of grade point hours earned. The official Marquette GPA of all students is calculated by the student information system and this GPA is not rounded up or down for any reason. To graduate with Latin honors, candidates must be pursuing their first bachelor's degree, earned at least 60 grade point hours and 60 degree hours at Marquette University, normally as a junior and senior. First bachelor's degree is defined as the first bachelor's degree earned from any institution. When students earn a concurrent additional bachelor's degree (i.e., finish in the same term as the first bachelor's degree), the additional degree is also eligible for Graduation Latin Honors, if the first bachelor's degree qualifies.

Graduates whose grade point average is 3.500, graduate with cum laude (Latin for 'with honor'); graduates whose grade point average is 3.700, graduate with magna cum laude (Latin for 'with great honor'); and graduates whose grade point average is 3.900, graduate with summa cum laude (Latin for 'with highest honor'). Graduation Latin honors are recorded on diplomas, noted in the published lists of graduates at Commencement and recorded on students' transcript.

Graduation Record

The academic record of students is frozen once the degree is posted and may not be altered thereafter, unless required to do so by law and/or a documented university error is discovered after the degree is posted. This includes, but is not limited to: all relevant grade point averages, grades, additional information relating to the degree(s), major(s), minor(s), concentration(s), Latin Honors and academic censure.

Marquette Core Curriculum (MCC) - 30 Credits

Foundation Tier - 15 Credits

Code	Title	Hours
ENGL 1001 or HOPR 1955H	Foundations in Rhetoric Core Honors First-Year Seminar	
PHIL 1001 or PHIL 1001H	Foundations in Philosophy Honors Foundations in Philosophy	
THEO 1001 or THEO 1001H	Foundations in Theology: Finding God in all Things Honors Foundations in Theology: Finding God in all Things	
CORE 1929 or CORE 1929H	Foundations in Methods of Inquiry Honors Foundations in Methods of Inquiry	
	Engaging Social Systems and Values 1 (ESSV1)	

Engaging Social Systems and Values 1 (ESSV 1) Course Options

Some faculty-led study abroad courses have also been approved for ESSV1, consult the MCC website (<https://www.marquette.edu/core-curriculum/mcc-study-abroad.php>) for a complete list.

Code	Title	Hours
ANTH 1001	Being Human	3
EDUC 1001	Child and Adolescent Development and Learning	3
ENGL 2020	Texts, Social Systems and Values	3
ENGL 2030	Global Literatures	3
HEAL 1025	Culture and Health ¹	3
HIST 1101	Introduction to American History	3
HIST 1601	Difference and Democracy	3
HIST 1701	Engaging the World	3
HOPR 2956H	Honors Engaging Social Systems and Values 1: Engaging the City	3
INGS 1001	Introduction to Gender and Sexualities Studies	3
SOCI 1001	Principles of Sociology	3
SOWJ 1001	Introduction to Social Welfare and Justice	3

SPAN 3300	Peoples and Cultures of Spain	3
SPAN 3310	Peoples and Cultures of Latin America	3

¹ Honors (H) designation of same course number also fulfills MCC requirement.

Discovery Tier - 12 Credits

Students must complete **four** Discovery Tier courses, all from the **same** Discovery Theme. These four courses must include one course from each of the three content areas (Humanities, Natural Science and Mathematics, and Social Science), and one elective (an additional course from any of the three content areas). A maximum of two courses in the Discovery Tier can be applied toward a primary major. Additional dual counting may be allowed towards college-level requirements.

Students declare their Discovery Theme using the Discovery Tier Declaration Form (<https://www.marquette.edu/central/registrar/how-do-i-declare-change-mcc-discovery-tier-theme.php>) in CheckMarq.

For students who participate in a full-time (12 credits or more) Marquette-approved study abroad program, one study abroad course (minimum 2.5 transfer credits awarded) may fulfill the elective requirement of the Discovery Tier. Any additional MCC requirements may be fulfilled only when the approved transfer equivalent is an exact match to a specific MCC course.

Discovery Themes

The five discovery theme options are listed below. See additional information and course listings (<https://bulletin.marquette.edu/resources-opportunities/marquette-core-curriculum/#discoverythemestext>).

- Basic Needs and Justice
- Cognition, Memory and Intelligence
- Crossing Boundaries: The Movement of People, Goods and Ideas
- Expanding Our Horizons
- Individuals and Communities

Culminating Course - 3 Credits

Code	Title	Hours
CORE 4929	The Service of Faith and Promotion of Justice	
or CORE 4929H	Honors Service of Faith and Promotion of Justice	

ENGAGING SOCIAL SYSTEMS AND VALUES 2 (ESSV2) - ONE COURSE or Experience Required

Students must complete a course or approved experience that is designated "ESSV2." This requirement can be completed via one of the four Discovery Tier courses or through other degree requirements.

Some faculty-led study abroad courses have also been approved for ESSV2, consult the MCC website (<https://www.marquette.edu/core-curriculum/mcc-study-abroad.php>) for a complete list.

Code	Title	Hours
ADPR 4750	Strategic Communication in a Culturally Diverse Marketplace	3
ADVE 3986	Internship in Advertising	3
ANTH 3100	Urban Anthropology	3
ANTH 3986	Internship in Anthropology	3
ANTH 4986	Advanced Internship in Anthropology	3
ARBC 3200	Culture and Civilization of the Middle East (WRIT)	3
ARBC 3220	Arab and Muslim Women in the United States (WRIT)	3
ARSC 4953	Seminar In Urban Social Issues	3
BISC 3929	Reflective Analysis of Global Dental Brigade	0
BISC 4460	Practical Cases in Medicine	3
BULA 4001	Business Law for Accounting	3
CCOM 4986	Corporate Communication Internship	0-3
CHNS 3215	Chinese Cuisine and Culture	3

CMST 3120	Interpersonal Communication	3
CMST 4986	Internship in Communication Studies	0-3
CNEN 3860	Construction Materials and Methods	3
COMM 4986	Internship in Communication	0-3
CRLS 2540	Surveillance, Law and Society	3
CRLS 3150	Reentry and Life After Incarceration	3
CRLS 3170	Policy and Practice for Children Impacted by Incarceration	3
CRLS 3986	Internship and Seminar in Criminology and Law Studies	3
CRLS 4986	Advanced Internship and Seminar in Criminology and Law Studies	3
DGMD 3986	Internship in Digital Media	3
EDUC 4965	Student Teaching: Middle/Secondary	15
EDUC 4966	Student Teaching: Elementary/Middle	15
EDUC 4986	Community-Engaged Internship 1	3
EDUC 4987	Community-Engaged Internship 2	3
ENGL 2001	Ways of Knowing (WRIT)	3
ENGL 3140	Sociolinguistics	3
ENGL 3249	Creativity and Community	3
ENGL 3250	Life-Writing, Creativity and Community (WRIT)	3
ENGL 3261	Poetry and Community (WRIT)	3
ENGL 3780	Water Is Life: Indigenous Art and Activism in Changing Climates (WRIT)	3
ENGL 4221	The Rhetoric of Martin Luther King, Jr. and Malcolm X (WRIT)	3
ENGL 4222	Feminist Rhetorics (WRIT)	3
ENGL 4223	The Rhetoric of Black Protest (WRIT)	3
ENGL 4230	Writing Center Theory, Practice and Research (WRIT)	4
ENGL 4453	Romanticism and Nature (WRIT)	3
ENGL 4631	Toni Morrison (WRIT)	3
ENGL 4825	Native American / Indigenous Literatures (WRIT)	3
ENGL 4826	Global Indigenous Literatures (WRIT)	3
ENGL 4988	Practicum in Literature and Language Arts	1-3
EXPH 4986	Exercise Physiology Practicum 2	6-16
GEEN 2960	Engineering Social Systems and Values	0
GRMN 3540	Heckling Hitler	3
GRMN 3550	German Reunification: The Collision of Two Worlds	3
HESC 3929	Global Brigades Reflective Analysis	0
HIST 4120	American Immigration	3
HIST 4125	Latinx Civil Rights Movements	3
HIST 4135	African-American History	3
HIST 4140	American Urban History	3
HIST 4155	A History of Native America	3
HIST 4247	Comparative Homefronts during the Second World War	3
INPS 2010	Introduction to Peace Studies	3
JOUR 3986	Internship in Journalism	0-3
JOUR 4986	Internship in Journalism	0-3
LLAC 1010	Working Without Borders	3
LLAC 3220	Cultures and Foodways	3
LLAC 3250	Linguistic Diversity and Social Justice	3
MANA 3035	Diversity in Organizations	3
MARQ 3929	Engaging Social Systems and Values Reflective Analysis	0
MARQ 3961	International Service Learning - Living Justice: Accompaniment in an Unjust World	3
NURS 3956H	Honors Nursing Practicum 1	1
NURS 3965	Community and Population Health Nursing - Clinical ¹	2
PHIL 3502	Narrating Freedom: Gender, Race and Mass Incarceration	3

PHIL 3507	Global Justice	3
PHTH 4512	Culture and Disability	3
PSYC 3201	Introductory Social Psychology	3
PSYC 3420	Health Psychology	3
PURE 3986	Internship in Public Relations	0-3
SOCI 3700	Social Movements, Protest and Change	3
SOCI 3986	Internship and Seminar in Sociology	3
SOCI 4986	Advanced Internship and Seminar in Sociology	3
SOWJ 3170	Policy and Practice for Children Impacted by Incarceration	3
SOWJ 3400	Advocacy and Social Change: Theory and Practice	3
SOWJ 3986	Internship in Social Welfare and Justice	3
SOWJ 4700	Global Aid and Humanitarianism	3
SOWJ 4986	Advanced Internship in Social Welfare and Justice	3
SPAN 3001	Advanced Communication in Spanish	3
SPAN 4150	Spanish in the United States	3
THAR 3620	Multicultural Playwrights	3
THAR 4986	Internship in Theatre Arts	0-3
THEO 2500	Theologies of Nonviolence ¹	3
THEO 3250	Contemplation and Action	3
THEO 3350	Christian-Muslim Dialogue	3
THEO 3600	Theology Engaging Culture	3
THEO 4270	The Many Faces of U.S. Catholicism	3
THEO 4400	Christian Faith and Justice ¹	3

¹ Honors (H) designation of same course number also fulfills MCC requirement.

WRITING INTENSIVE COURSES (WRIT) - ONE COURSE REQUIRED

Students must complete a course that is designated "WRIT." This requirement can be completed via one of their four Discovery Tier courses or through other degree requirements.

Some faculty-led study abroad courses have also been approved, consult the MCC website (<https://www.marquette.edu/core-curriculum/mcc-study-abroad.php>) for a complete list.

Code	Title	Hours
ACCO 4000	Accounting Communications	3
ADPR 2200	Media Writing	3
ANTH 2101	Cultural Anthropology	3
ARBC 3200	Culture and Civilization of the Middle East (ESSV2)	3
ARBC 3210	Arabic Literature in English Translation	3
ARBC 3220	Arab and Muslim Women in the United States (ESSV2)	3
BIOL 4102	Experimental Molecular Biology	3
BIOL 4202	Experimental Genetics	3
BIOL 4302	Experimental Cell Biology	3
BIOL 4402	Experimental Ecology and Field Biology	3
BIOL 4403	Tropical Ecology in Panama	3
BIOL 4502	Experimental Neurobiology	3
BIOL 4702	Experimental Physiology	3
BIOL 4802	Experimental Microbiology	3
BISC 4325	Endocrinology	3
BUAD 4010	Business in Film	3
BULA 3001	Legal and Ethical Environment of Business	3
CCOM 3250	Corporate Writing	3
CMST 3000	Theories in Communication Studies	3
CRLS 3050	Methods of Criminological Research	3

CRLS 3150	Reentry and Life After Incarceration	3
EDUC 4000	Educational Inquiry 2: Advanced Topics	3
EDUC 4540	Philosophy of Education	3
ELEN 3025	Electrical Instrumentation Laboratory	2
ENGL 2001	Ways of Knowing (ESSV2)	3
ENGL 2011	Books that Matter	3
ENGL 2012	Well Versed	3
ENGL 3000	Introduction to Literary Studies	3
ENGL 3210	Writing Practices and Processes	3
ENGL 3220	Writing for Workplaces	3
ENGL 3221	Technical Writing	3
ENGL 3222	Writing for Health and Medicine	3
ENGL 3240	Introduction to Creative Writing	3
ENGL 3241	Crafting the Short Story	3
ENGL 3242	Writing Science Fiction and Fantasy	3
ENGL 3245	Creative Nonfiction	3
ENGL 3250	Life-Writing, Creativity and Community (ESSV2)	3
ENGL 3261	Poetry and Community (ESSV2)	3
ENGL 3301	Here Be Monsters	3
ENGL 3302	Crossing Over	3
ENGL 3410	Drama	3
ENGL 3462	Introduction to Gothic Fiction	3
ENGL 3513	Modern Irish Literature	3
ENGL 3514	Contemporary Irish Literature	3
ENGL 3517	Memory and Forgetting in Contemporary Historical Fiction	3
ENGL 3751	The Art of War	3
ENGL 3761	Medicine and Literature	3
ENGL 3762	Disability and Literature	3
ENGL 3780	Water Is Life: Indigenous Art and Activism in Changing Climates (ESSV2)	3
ENGL 3785	LGBTQ+ Narratives: Literature, Film, Theory	3
ENGL 3841	Global Hip Hop	3
ENGL 3860	The Russian Novel and the Search for Meaning	3
ENGL 4210	Writing, Literacy, and Rhetoric Studies	3
ENGL 4220	Rhetorical Theories and Practices ¹	3
ENGL 4221	The Rhetoric of Martin Luther King, Jr. and Malcolm X (ESSV2)	3
ENGL 4222	Feminist Rhetorics (ESSV2)	3
ENGL 4223	The Rhetoric of Black Protest (ESSV2)	3
ENGL 4224	Radical Writing: An Invitation to the Self	3
ENGL 4230	Writing Center Theory, Practice and Research (ESSV2)	4
ENGL 4250	Creative Writing: Fiction	3
ENGL 4260	Creative Writing: Poetry	3
ENGL 4303	Studies in the Medieval Imagination	3
ENGL 4311	Themes in Medieval Literature	3
ENGL 4331	Shakespeare	3
ENGL 4402	The Novel to 1900	3
ENGL 4412	Transatlantic Literature, 1700-1900	3
ENGL 4422	British Literature of the Long 18th Century	3
ENGL 4423	Legal Fictions of the Enlightenment	3
ENGL 4453	Romanticism and Nature (ESSV2)	3
ENGL 4472	British Literature of the Victorian Period, 1837-1900	3
ENGL 4616	Moby-Dick	3
ENGL 4631	Toni Morrison (ESSV2)	3

ENGL 4715	Children's Literature	3
ENGL 4730	What Is a Book?	3
ENGL 4734	The Epic	3
ENGL 4738	Poetry	3
ENGL 4739	Words to Worlds	3
ENGL 4755	Law and Literature	3
ENGL 4765	Material Cultures	3
ENGL 4786	Women Writers	3
ENGL 4810	Comparative Race and Ethnic Studies	3
ENGL 4820	Studies in Critical Race and Ethnic Studies	3
ENGL 4825	Native American / Indigenous Literatures (ESSV2)	3
ENGL 4826	Global Indigenous Literatures (ESSV2)	3
ENGL 4830	Africana Literatures	3
ENGL 4932	Topics in Writing	3
ENGL 4954	Seminar in Creative Writing	3
ENGL 4997	Capstone	3
EXPH 4020	Clinical Case Management in Exercise Science	3
FREN 4110	Advanced Grammar and Written Expression in French	3
FREN 4270	French Holocaust Writings in English Translation	3
FREN 4280	Creative Writing in French	3
GRMN 3500	The Modern German Short Story	3
GRMN 3505	The Modern German Short Story in English	3
HIST 1301	History of Latin America	3
HIST 3104	The Civil War Era	3
HIST 4210	The Black Death	3
HIST 4460	Race and History of South Africa	3
HIST 4955	Undergraduate Seminar in History	3
JOUR 4150	Investigative Reporting	3
MANA 3002	Business and Its Environment	3
MLSC 4180	Concepts in Clinical Education Methods and Practicum	2
NURS 4000	Quality and Safety in Nursing	3
PHIL 3505	Philosophy and Film	3
PHIL 3610	Ancient Philosophy	3
PHIL 4540	Philosophy of Education	3
PHTH 7505	Patient/Client Management 3 ²	2
PHTH 7974	Clinical Education Experience 1 ³	4
POSC 3101	Writing and Argumentation in Political Science	3
PURE 3600	Public Relations Writing	3
SOCI 3050	Methods of Social Research	3
SPAN 3001	Advanced Communication in Spanish	3
SPAN 3005	Advanced Communication in Spanish for Heritage Speakers	3
SPAN 3500	Texts, Images and Critical Thinking in Spanish	3
SPAN 3505	Texts, Images, and Critical Thinking in Spanish for Heritage and Native Speakers	3
SPAN 4700	Creative Writing in Spanish	3
STCM 3400	Writing for Strategic Communication	3
THAR 4600	Playwriting	3
THEO 3130	Miracles ¹	3
THEO 3530	Theology and Economics ¹	3
THEO 4210	History and Theology of the Christian East	3
THEO 4300	The Question of God in a Secular Age ¹	3
THEO 4460	Religion, Science and Ethics	3

- ¹ Honors (H) designation of same course number also fulfills MCC requirements.
- ² With PPTH 7974 Clinical Education Experience 1
- ³ With PPTH 7505 Patient/Client Management 3

Grade Minimums & Additional Information

- A grade of C or better is required in Honors MCC courses. A passing grade is required in non-Honors MCC courses.
- Review the Marquette Core Curriculum (<https://bulletin.marquette.edu/resources-opportunities/marquette-core-curriculum/>) section of the bulletin for additional information, including transfer student requirements and Discovery Theme details.

Major in Biophysics

The major in biophysics consists of 51 credit hours. Students complete the common physics core: one required physics core sequence of two courses (8 credit hours), four required physics core courses (13 credit hours), and three required physics seminar courses (3 credit hours); one required biology core sequence (6 credit hours), and three required biology courses (9 credit hours); six credit hours of approved physics electives from Group A and six additional credit hours of approved upper division electives (12 credit hours) in either biology, chemistry, mathematics or physics, taken from Groups A and B, listed below. In addition, students complete four required mathematics courses (16 credit hours), and three required chemistry courses (9-12 credit hours) for a total of 25-28 credit hours of background course work.

Common Biophysics Core:

Code	Title	Hours
Required Physics Core:		
Choose one sequence of the following (PHYS 1013 / PHYS 1014 are recommended):		8
PHYS 1001 & PHYS 1002	General Physics 1 and General Physics 2	
PHYS 1003 & PHYS 1004	General Physics with Introductory Calculus 1 and General Physics with Introductory Calculus 2	
PHYS 1013 & PHYS 1014	Classical and Modern Physics with Calculus 1 and Classical and Modern Physics with Calculus 2	
PHYS 2400	The Microscopic World	3
PHYS 2500	Oscillations and Waves with Laboratory	4
PHYS 4046	The Physical Basis of Biological Structure and Function	3
PHYS 4065	Experimental Methods in Molecular Biophysics	3
Required Physics Seminar Courses:		
PHYS 1953	Discovering Physics	1
PHYS 1954	Communicating Physics	1
PHYS 2954	Participating in Physics	1
Required Biology Core:		
BIOL 1001 & BIOL 1002	General Biology 1 and General Biology 2	6
BIOL 3301	Cell Biology	3
BIOL 3101	Biochemistry and the Molecular Basis of Biology ¹	3
BIOL 4102 or BIOL 4302	Experimental Molecular Biology Experimental Cell Biology	3
Electives: Upper-division courses in Biology, Chemistry, Mathematics or Physics from the list of recommended electives below.		12
Total Credit Hours:		51

- ¹ Instructor's consent required for registration in BIOL 3101.

Note: PHYS 1013 (http://bulletin.marquette.edu/undergrad/helenwayklinglercollegeofartsandsciences/physics_phys/) Classical and Modern Physics with Calculus 1 and PHYS 1014 (http://bulletin.marquette.edu/undergrad/helenwayklinglercollegeofartsandsciences/physics_phys/) Classical and Modern Physics with Calculus 2 are studio style courses recommended for students considering a physics major.

Required Background Mathematics and Chemistry courses:

Code	Title	Hours
Math Courses:		
MATH 1450	Calculus 1	4

MATH 1455 or MATH 1451	Calculus 2 Integral Calculus	4
MATH 2440 or MATH 2450	Calculus 3 ¹ Multivariable Calculus	4
MATH 2451	Differential Equations	4
General Chemistry Sequence		
CHEM 1001 & CHEM 1002	General Chemistry 1 and General Chemistry 2	8
Organic Chemistry Requirement - choose one of the following: ²		1-4
CHEM 2111	Organic Chemistry 1	
CHEM 2113	Organic Chemistry for Majors 1	
CHEM 2131	CHEM 2111 Lecture Only	
BISC 2050	Organic Chemistry for the Health Sciences	

Total Credit Hours:**25-28**

¹ Students with AP credit for MATH 1451 Integral Calculus should take MATH 2450 Multivariable Calculus.

² Students are required to take BIOL 3101, which requires the instructor's permission if the student took CHEM 2131 or BISC 2050 to fulfill the organic chemistry requirement. The instructors of BIOL 3101 further recommend that students take a second course in organic chemistry (either CHEM 2112 or CHEM 2114), which are not required by the Biophysics major. Additionally, the Biophysics Group B elective CHEM 4530 strictly requires the student's prior completion of CHEM 2111 or CHEM 2113.

Biophysics Major Recommended Electives:

The major requires 12 credit hours of electives which should be drawn from these lists as follows: 6 credit hours of approved upper division electives in physics must be taken from Group A; six additional credit hours of approved upper division electives in biology, chemistry, mathematics or physics must be taken from courses in either Group A or Group B. Any exceptions must be approved by the Physics department.

Group A:

Code	Title	Hours
PHYS 3100	Classical Mechanics	3
PHYS 4012	Quantum Mechanics	3
PHYS 4031	Electricity and Magnetism	3
PHYS 4034	Modern Optics	3
PHYS 4062	Introduction to Thermodynamics	3
PHYS 4071	Atomic Physics	3

Group B:

Code	Title	Hours
PHYS 2953	Computational Methods in Physics ¹	1
PHYS 4956	Undergraduate Research in Physics ²	1-3
BIEN 4500	Medical Imaging Physics	3
BIOL 3201	Genetics	3
BIOL 4102	Experimental Molecular Biology	3
BIOL 4202	Experimental Genetics	3
BIOL 4302	Experimental Cell Biology	3
BIOL 4501	Cellular Neurobiology	3
BIOL 4502	Experimental Neurobiology	3
BIOL 4701	Human Physiology	4
BIOL 4702	Experimental Physiology	3
BIOL 4956	Laboratory Research Project in Biological Sciences ²	1-3
BIOL 8101	Protein Structure and Function ³	2
BIOL 8102	Biochemistry and Function of Nucleic Acids ³	2
CHEM 4431	Physical Chemistry: Fundamentals with Applications in Biological Sciences	3
CHEM 4433	Physical Chemistry 1	3

CHEM 4434	Physical Chemistry 2	3
CHEM 4530	Biochemistry 1: Macromolecular Structure and Function	3
CHEM 4956	Undergraduate Research in Chemistry ²	1-3
MATH 4740	Biostatistical Methods and Models	3

¹ Highly recommended for all majors. Should be taken concurrent with PHYS 2400.

² Credits from these courses to satisfy elective requirements require prior recommendation of academic adviser, course instructor and consent of department chair. Highly recommended for students interested in a research career in biophysics.

³ Requires consent of Biology department for undergraduate enrollment in a graduate level course.

Typical Program for Biophysics Majors

Freshman

First Term	Hours	Second Term	Hours
ARSC 1953		1 BIOL 1002	3
BIOL 1001		3 CHEM 1002	4
CHEM 1001		4 PHYS 1002, 1004, or 1014 ¹	4
PHYS 1001, 1003, or 1013 ¹		4 ENGL 1001 or ESSV1 (MCC)	3
ENGL 1001 or ESSV1 (MCC)		3 PHYS 1954	1
PHYS 1953		1	
	16		15

Sophomore

First Term	Hours	Second Term	Hours
BIOL 3301		3 CHEM 2112	4
CHEM 2111		4 MATH 1455	4
MATH 1450		4 CORE 1929 (MCC)	3
PHIL 1001 or THEO 1001 (MCC)		3 PHIL 1001 or THEO 1001 (MCC)	3
	14		14

Junior

First Term	Hours	Second Term	Hours
BIOL 3101		3 MATH 2451	4
MATH 2440		4 BIOL 4102 or 4302	3
PHYS 2400		3 PHYS 2500	4
PHYS 2953		1 PHYS 2954	1
PHYS 4031		3 DSCV (MCC) ^{2,3}	3
DSCV (MCC) ^{2,3}		3 DSCV (MCC) ^{2,3}	3
	17		18

Senior

First Term	Hours	Second Term	Hours
PHYS 4046		3 PHYS 4065	3
Group A elective ⁴		3 Group A elective ⁴	3
Group A or B elective ⁵		3 Group A or B elective ⁵	3
CORE 4929 (MCC)		3 Electives	7

DSCV (MCC)^{2,3}

3

15

16

Total Credit Hours: 125

- 1 PHYS 1013 / PHYS 1014 recommended.
- 2 The four courses in the Discovery Tier (DSCV) of the MCC must be completed in the same theme and include the following content areas: Humanities (HUM), Social Science (SSC), Natural Science and Mathematics (NSM) and one elective (ELE), which is an additional course from any of the three content areas. A maximum of two courses in the Discovery Tier can apply towards a primary major.
- 3 Students must also complete the Writing Intensive (WRIT) and Engaging Social System and Values 2 (ESSV2) requirements of the MCC. These requirements can be fulfilled through designated courses in the Discovery Tier or other degree requirements.
- 4 Upper division physics elective from PHYS 3100, PHYS 4012 (strongly recommended), PHYS 4031, PHYS 4034 and PHYS 4062 (strongly recommended).
- 5 Elective from: PHYS 3100, PHYS 4012, PHYS 4062; BIEN 4500; BIOL 3201, BIOL 4202, BIOL 4501, BIOL 4502, BIOL 4701, BIOL 4956*, BIOL 8101, BIOL 8102; CHEM 4431, CHEM 4433, CHEM 4434, CHEM 4530, CHEM 4956*; MATH 4740. *These courses require prior recommendation of academic adviser and consent of department chair; these courses are highly recommended for student interested in a career in biophysics research.

University Policies

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College of Arts and Sciences Policies

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Disciplinary Honors in Physics

Program Director: Dr. Andrew Kunz

Curriculum Requirements

Recommended Prerequisites

Code	Title	Hours
PHYS 1013H or PHYS 1003H	Honors Classical and Modern Physics with Calculus 1 Honors General Physics with Introductory Calculus 1	4
PHYS 1014H or PHYS 1004H	Honors Classical and Modern Physics with Calculus 2 Honors General Physics with Introductory Calculus 2	4

Total Credit Hours: 8

Requirements for Physics Disciplinary Honors

Code	Title	Hours
PHYS 4953H	Honors Seminar in Physics	1
PHYS 4956H	Honors Undergraduate Research	6

- Students are expected to enroll in PHYS 4953H Honors Seminar in Physics during the fall term of the junior year.
- The 6 credits of PHYS 4956H Honors Undergraduate Research must be taken over at least two terms.

Eligibility

1. Overall cumulative GPA of 3.200 or higher at time of application.
2. Written statement – In a written statement (1-2 pages), the student should summarize his/her reasons for applying to the honors program. In addition, the statement should address the student's plans with respect to undergraduate research and career objectives.

Application

Students are encouraged to apply to the disciplinary honors program in physics during the spring term of their sophomore year. Applications may also be accepted in the fall term of the junior year in rare cases. Applications should be submitted directly to the physics department office. Sample statements, application deadlines and forms are available on the Department of Physics Web page. Additional questions can be directed to the disciplinary honors director, Dr. Andrew Kunz. The program director evaluates applications and makes decisions regarding admission to the program.

Academic Standards

If a student drops below a 3.200 in any given term during the junior year or any subsequent year, the student receives a letter of warning from the director. If a student drops below a 3.200 cumulative GPA, they are placed on Honors Program academic probation; if they do not achieve a 3.200 cumulative by the end of the following term, they are removed from the program. Students must earn a grade of C or better in a course for it to count toward the disciplinary honors requirements.