

# Biomechanics, BBE

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The Biomechanics Major integrates life sciences education with training in mechanical engineering, including materials, thermodynamics, fluids, transport phenomena and human modeling and simulation. In their senior year, students complete an intensive laboratory component emphasizing measurement of biomechanical loading in both static and dynamic environments. In addition, the senior year capstone design course places students on a multidisciplinary team to solve an actual industrial design problem.

This major is perfect for students interested in Biomaterials, Orthopedic Rehabilitation and Tissue Engineering.

## DEGREE REQUIREMENTS

All engineering students must successfully complete the curriculum prescribed in the Undergraduate Bulletin by the college at the time they are admitted or readmitted as degree candidates. This includes the requirements of the minimum number of degree hours earned, all required courses and an approved elective program, a C (2.000) average in all Marquette credits applied toward the degree, and a C (2.000) average in all Opus College of Engineering courses. Note: The BS in Biomedical Engineering requires a minimum 2.500 in all Marquette work. The Engineering Leadership concentration requires a minimum 2.800 in all Marquette work. The BS in Biomedical Engineering requires a minimum 2.500 in all Opus College of Engineering courses. The BS in Biomedical Engineering requires a minimum 2.500 GPA in all biomedical engineering major courses. A minimum of 60 credits must be taken at Marquette University. The final 30 credits must be taken at Marquette University or in an approved study abroad program unless given prior approval from the Office of the Provost. The 32 credit hours of upper division course work must be taken at Marquette University. At least 15 credit hours of course work in the major must be completed at Marquette University.

The following conditions apply under special circumstances:

1. If all degree credit is earned in continuous study in engineering at Marquette, the fulfillment of all degree requirements is normally straightforward. Students making an inter-college curriculum change have credits earned in a previous curriculum allocated to the new curriculum by the Office of Academic Affairs through consultations with the appropriate department chair or their designate.
2. Students who have interrupted their enrollment from the university are normally obliged to follow the curriculum in effect at the time of readmission or more directly they must complete the courses prescribed by their department at the time of readmission. Normally, this is defined in concert with the Director of Student Studies and Records in consultation with department chair or their designate. Policies and regulations that are in effect at the time of return apply to all students, regardless of the term of initial enrollment.
3. Transfer students coming into engineering degree programs have their previous credits evaluated and applied toward the specific engineering degree they are pursuing, at the time of admission.
4. Students may elect to repeat courses at Marquette using the Course Repeat (<https://bulletin.marquette.edu/policies/repeated-courses/>) policy. The repeated course grade is used in the computation of the GPA. The first grade is removed from the GPA. The original grade remains on the student's record. Students must complete and submit a Request to Repeat an Undergraduate Course form. Note: For Opus College of Engineering students, the Course Repeat cannot be used more than five times throughout their career.
5. Credit/No Credit (CR/NC), Satisfactory/Unsatisfactory (S/U) grades do not affect the student's GPAs, only degree hours earned. The same rule applies to credit added through Advanced Placement programs, Credit by Examination and CLEP exams.
6. Any variation from standard degree requirements must be accompanied by approved Curriculum Substitution and/or Allowance Request forms, which are available on the Engineering Academic Advising Center (<http://www.marquette.edu/engineering/academic-advising-center/>) website.

## College GRADUATION REQUIREMENT

A degree of Bachelor of Science in Biomedical Engineering, Bachelor of Science in Civil Engineering, Bachelor of Science in Construction Engineering, Bachelor of Science in Computer Engineering, Bachelor of Science in Electrical Engineering or Bachelor of Science in Mechanical Engineering may be conferred on students who successfully complete the curriculum prescribed for the degree, and who have satisfied the following requirements:

1. The Opus College of Engineering graduates students three times each year (May, August, and December).
2. Students who plan to graduate must apply for a degree through the submission of an Application for Graduation no later than the deadline posted in the Academic Calendar (<http://www.marquette.edu/calendar/>).
3. Graduation requirements include:
 

It is the responsibility of students to know and fulfill all university and college requirements. Note: In addition, students are required to adhere to the following college graduation requirements.

  - Minimum of 128-134 earned credit hours, depending on the major chosen.
  - Minimum 2.000 GPA in all Marquette work. The BS in Biomedical Engineering requires a minimum 2.500 in all Marquette work. The Engineering Leadership concentration requires a minimum 2.800 in all Marquette work.
  - Minimum 2.000 GPA in all Opus College of Engineering courses. The BS in Biomedical Engineering requires a minimum 2.500 in all Opus College of Engineering courses.

- The BS in Biomedical Engineering requires a minimum 2.500 GPA in all biomedical engineering major courses.
  - Completion of all required courses and an approved elective program.
4. Students are cautioned to enter their last term with a clear understanding that they are satisfying all degree requirements. Students should view their Academic Advisement (AA) Graduation Checklist in CheckMarq. If any requirements appear as - Not Satisfied, the Engineering Academic Advising Center (<http://www.marquette.edu/engineering/academic-advising-center/>) may be consulted to resolve any concerns.
  5. All curricular modifications must be accompanied by approved Curriculum Substitution and/or Allowance Request forms, which are available through the Engineering Academic Advising Center (<http://www.marquette.edu/engineering/academic-advising-center/>) website.
  6. All degree requirements must be completed on schedule and according to deadlines established in the Academic Calendar. Incomplete grades and late exams delay graduation for at least one term.
  7. A final check of students' degree requirements is made by the students' departments and the director of Student Studies and Records during the last term and students are notified if they fail to meet any requirements. However, this may be too late to adjust the term course load.
  8. In addition, the Opus College of Engineering adheres to the University Commencement Policy (<https://bulletin.marquette.edu/policies/commencement/>).

## 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 <sup>1</sup>	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

<sup>1</sup> 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 <sup>1</sup>	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 <sup>1</sup>	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 <sup>1</sup>	3

<sup>1</sup> 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 <sup>1</sup>	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 <sup>2</sup>	2
PHTH 7974	Clinical Education Experience 1 <sup>3</sup>	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 <sup>1</sup>	3
THEO 3530	Theology and Economics <sup>1</sup>	3
THEO 4210	History and Theology of the Christian East	3



THEO 4300	The Question of God in a Secular Age <sup>1</sup>	3
THEO 4460	Religion, Science and Ethics	3

<sup>1</sup> Honors (H) designation of same course number also fulfills MCC requirements.

<sup>2</sup> With PHTH 7974 Clinical Education Experience 1

<sup>3</sup> With PHTH 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.

## Biomechanics Major

### Freshman

First Term	Hours	Second Term	Hours
BIEN 1100		2 BIEN 1110	2
BIOL 1001		3 ENGL 1001 or ESSV1 (MCC)	3
ENGL 1001 or ESSV1 (MCC)		3 MATH 1455	4
MATH 1450		4 PHYS 1004	4
PHYS 1003		4 PHIL 1001 or THEO 1001 (MCC)	3
	<b>16</b>		<b>16</b>

### Sophomore

First Term	Hours	Second Term	Hours
BIEN 1120		2 BIEN 2100	3
BIEN 2200		1 BIEN 2300	4
GEEN 2110		3 GEEN 2120	3
GEEN 2952		1 MEEN 2460	3
CHEM 1001		4 CORE 1929	3
MATH 2451		4	
PHIL 1001 or THEO 1001 (MCC)		3	
	<b>18</b>		<b>16</b>

### Junior

First Term	Hours	Second Term	Hours
BIEN 3300		3 BIEN 3200 or MEEN 3310	3
BIEN 4320		3 BIEN 3310	3
MEEN 3310 or BIEN 3200		3 BIEN 3400 or DSCV (MCC) <sup>1,2</sup>	3
BIEN 3400 or DSCV (MCC) <sup>1,2</sup>		3 BIEN 4700	3
DSCV (MCC) <sup>1,2</sup>		3 GEEN 2130	3
		DSCV (MCC) <sup>1,2</sup>	3
	<b>15</b>		<b>18</b>

### Senior

First Term	Hours	Second Term	Hours
BIEN 4400 or BIEN ELECTIVE <sup>3</sup>		3 BIEN 4400 or BIEN ELECTIVE <sup>3</sup>	3

BIEN 4480	3	BIEN 4490	3
BIEN 4920	3	BIEN 4998	3
DSCV (MCC) <sup>1, 2</sup>	3	BIEN elective <sup>3</sup>	3
BIEN elective <sup>3</sup>	3	CORE 4929 (MCC)	3
<b>15</b>		<b>15</b>	

**Total Credit Hours: 129**

- <sup>1</sup> 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.
- <sup>2</sup> 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.
- <sup>3</sup> See Biomedical Engineering elective list below.

**Biomedical Engineering Electives**

The following is a list of electives typically taken by biomedical engineering students. This list is not inclusive. A total of 9 credit hours of BIEN Electives are required. Other possible electives include upper division courses in MATH, BIOL, PHYS, CHEM, EECE, MEEN, COEN and related subject areas. These courses can be taken if approved by the adviser, department chair and associate dean through a course substitution form. Medical school bound students are strongly encouraged to take CHEM 2111 Organic Chemistry 1, CHEM 2112 Organic Chemistry 2 and BIOL 4101 Biochemistry and the Molecular Basis of Biology as electives.

Code	Title	Hours
BIEN 4220	Embedded Biomedical Instrumentation	3
BIEN 4230	Intelligent Biosystems	3
BIEN 4410	Applied Finite Element Analysis	3
BIEN 4420	Biomaterials Science and Engineering	3
BIEN 4500	Medical Imaging Physics	3
BIEN 4510	Image Processing for the Biomedical Sciences	3
BIEN 4600	Neural Engineering	3
BIEN 4610	Introduction to Rehabilitation Robotics	3
BIEN 4620	Rehabilitation Science and Engineering	3
BIEN 4630	Rehabilitation Engineering: Prosthetics, Orthotics, Seating and Positioning	3
BIEN 4640	Bioengineering of Living Actuators	3
BIEN 4710	Analysis of Physiological Models	3
BIEN 4720	Cardiopulmonary Mechanics	3
BIEN 4931	Topics in Biomedical Engineering	1-3
BIEN 4995	Independent Study in Biomedical Engineering (GPA>3.0)	1-4
COEN 4620	Modern Programming Practices	3
COEN 4650	Introduction to Algorithms	3
ELEN 3025	Electrical Instrumentation Laboratory	2
ELEN 3035	Electronics Projects Laboratory	2
ELEN 3110	Electromagnetic Fields 1	3
ELEN 3120	Electromagnetic Fields 2	3
MEEN 3220	Dynamics of Mechanical Systems	3
MEEN 3250	Design of Machine Elements 1	4
MEEN 3260	Numerical Methods of Mechanical Systems	3
MEEN 3330	Fundamentals of Heat Transfer	3
MEEN 3460	Materials Selection in Mechanical Design	3
MEEN 4220	Intermediate Dynamics	3
MEEN 4230	Intermediate Mechanics of Materials	3
MEEN 4240	Polymers and Polymer Composites	3
MEEN 4420	Failure Analysis	3

BIOL 4101	Biochemistry and the Molecular Basis of Biology	3
BIOL 4702	Experimental Physiology	3
CHEM 2111	Organic Chemistry 1	4
CHEM 2112	Organic Chemistry 2	4
MATH 2450	Multivariable Calculus	4
MATH 4630	Mathematical Modeling and Analysis	3

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## College of Engineering Policies

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- Academic Dismissal/Probation/College Academic Alert (CAA) (<https://bulletin.marquette.edu/engineering/policies/dismissal-probation-college-alert/>)
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- Undergraduate Independent Study (<https://bulletin.marquette.edu/engineering/policies/undergraduate-independent-study/>)