

Electrical Engineering, BEE

The electrical engineering major provides students with a comprehensive electrical engineering background. Through an ample elective program, students can customize their studies within five broad categories: Electronic Devices and Systems; Signals, Systems & Control; Electromagnetic Fields and Communication; Power and Energy Systems and Computer Hardware and Software.

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 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.

Electrical Engineering

The electrical engineering major provides students with a comprehensive electrical engineering background including course specialties in five broad categories: Electronic Devices and Systems; Signals, Systems & Control; Electromagnetic Fields and Communication; Power and Energy Systems and Computer Hardware and Software.

Freshman

| First Term | Hours | Second Term | Hours |
|------------------------------|-------|----------------------------|-----------|
| EECE 1200 | | 2 EECE 1210 | 2 |
| ENGL 1001 or ESSV1 (MCC) | | 3 EECE 1610 | 3 |
| MATH 1450 | | 4 ENGL 1001 or ESSV1 (MCC) | 3 |
| PHYS 1003 | | 4 MATH 1455 | 4 |
| THEO 1001 or PHIL 1001 (MCC) | | 3 PHYS 1004 | 4 |
| | | 16 | 16 |

Sophomore

| First Term | Hours | Second Term | Hours |
|-----------------|-------|--------------------------------|-----------|
| EECE 2010 | | 3 EECE 2030 | 3 |
| EECE 2015 | | 1 EECE 2035 | 1 |
| GEEN 2952 | | 1 ELEN 2020 | 3 |
| CHEM 1001 | | 4 ELEN 2040 | 3 |
| MATH 4720 | | 3 MATH 2451 | 4 |
| CORE 1929 (MCC) | | 3 PHIL 1001 or THEO 1001 (MCC) | 3 |
| | | 15 | 17 |

Junior

| First Term | Hours | Second Term | Hours |
|---------------------------|-------|--------------------------------------|-----------|
| EECE 3010 | | 3 ELEN 3025 | 2 |
| EECE 3015 | | 2 ELEN 3030 | 3 |
| ELEN 3020 | | 3 EE elective ³ | 3 |
| ELEN 3110 | | 3 EE elective ³ | 3 |
| MATH 3100 | | 3 Science/Math elective ⁴ | 3 |
| DSCV (MCC) ^{1,2} | | 3 DSCV (MCC) ^{1,2} | 3 |
| | | 17 | 17 |

Senior

| First Term | Hours | Second Term | Hours |
|------------|-------|----------------------------|-------|
| ELEN 3035 | | 2 ELEN 4998 | 3 |
| ELEN 4920 | | 3 EE elective ³ | 3 |

| | | |
|----------------------------|------------------------------|-----------|
| EE elective ³ | 3 EE elective ³ | 3 |
| EE elective ³ | 3 CORE 4929 (MCC) | 3 |
| EE elective ³ | 3 DSCV (MCC) ^{1, 2} | 3 |
| DSCV (MCC) ^{1, 2} | 3 | |
| | 17 | 15 |

Total Credit Hours: 130

- ¹ 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.
- ² 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.
- ³ The seven EE Electives must satisfy both a breadth and a depth requirement. To satisfy the breadth requirement, the student must take EE electives in at least three of the following five areas: Electronic Devices and Systems; Signals, Systems and Control; Electromagnetic Fields and Communication; Power and Energy Systems; and Computer Hardware and Software. To satisfy the depth requirement, the student must take at least three EE electives in one of the aforementioned areas. A course listed in two concentration areas may be counted toward only one elective.
- ⁴ The science/math elective can be fulfilled with any upper division math or physics course (except PHYS 4031 Electricity and Magnetism) or any biology or chemistry course for which the prerequisite requirements are met.

Areas of Concentration within Electrical Engineering

The Electrical Engineering curriculum has seven electives designated as EE electives. At least five of these electives must be courses with an ELEN, EECE or COEN number as listed for the concentration areas. The remaining electives can be in any technical area. The student, in consultation with their adviser, must design the elective program to meet both a breadth requirement and a depth requirement. To meet the breadth requirement, students must choose at least one course from each of at least three of the concentration areas. To meet the depth requirement, at least three courses must be chosen from within a single concentration area. These areas of concentration and the courses in each area are described below.

Electronic Devices and Systems

Device Systems is based on the fundamental principles of solid state devices. These fundamentals are applied to the design and application of integrated circuits, nanotechnology, and state of the art devices. The following ELEN and EECE courses are available in the Device Systems area:

| Code | Title | Hours |
|-----------|---|-------|
| EECE 4410 | Introduction to Device Fabrication | 3 |
| EECE 4740 | Advanced VHDL and FPGA Design | 3 |
| ELEN 4430 | Physical Principles of Solid State Devices | 3 |
| ELEN 4440 | MEMS and Nanotechnology | 3 |
| ELEN 4460 | Sensor Devices: Theory, Design and Applications | 3 |
| ELEN 4490 | Developments in Devices | 1-3 |
| ELEN 4565 | Optical Fiber Communications | 3 |

Signals, Systems and Controls

Control system engineering develops a general background in automatic controls and systems engineering with a fundamental emphasis on linear feedback systems and applications of computers. Course work in advanced controls, digital systems, and large-scale design is included. The following ELEN and EECE elective courses are available in the Systems and Control area:

| Code | Title | Hours |
|-----------|--|-------|
| ELEN 4310 | Control Systems | 3 |
| ELEN 4320 | Digital Control Systems | 3 |
| ELEN 4390 | Developments in Control | 1-3 |
| EECE 4510 | Digital Signal Processing | 3 |
| EECE 4530 | Probability and Statistics for Engineers | 3 |
| ELEN 4550 | Developments in Signal Processing | 1-3 |
| ELEN 4560 | Introduction to Communication Systems | 3 |

| | | |
|-----------|--------------------------------|-----|
| ELEN 4565 | Optical Fiber Communications | 3 |
| ELEN 4590 | Developments in Communications | 1-3 |

Electromagnetic Fields and Communication

Applied electromagnetics and waves involve high frequency waves as applied to communications and sensing applications. Principles and applications of wireless communications are included. Fiber optics, antennas, modern communication cell systems, analog and digital modulation techniques, and sensor principles and applications are investigated. The following ELEN and EECE elective courses are available in the Electromagnetic Fields and Communication area:

| Code | Title | Hours |
|-----------|--|-------|
| ELEN 3120 | Electromagnetic Fields 2 | 3 |
| ELEN 4100 | Transmission Lines and Electromagnetic Waves | 3 |
| ELEN 4110 | Microwave Engineering | 3 |
| ELEN 4130 | Antenna Theory and Design | 3 |
| ELEN 4150 | Applied Finite Elements in Electromagnetics | 3 |
| ELEN 4190 | Developments in Electromagnetics | 1-3 |
| EECE 4510 | Digital Signal Processing | 3 |
| ELEN 4560 | Introduction to Communication Systems | 3 |
| ELEN 4565 | Optical Fiber Communications | 3 |
| ELEN 4570 | Wireless Communications | 3 |
| ELEN 4590 | Developments in Communications | 1-3 |

Power and Energy Systems

Power engineering emphasizes the control and conversion of electrical energy. Motors and generators with their associated electronic power controls, power distribution systems and control systems are examined. Modern computer-aided analysis is brought to bear on the design and analysis of power devices and power systems. The following ELEN elective courses are available in the Power and Energy area:

| Code | Title | Hours |
|-----------|---|-------|
| ELEN 3210 | Electric Drives | 3 |
| ELEN 4210 | Design and Analysis of Electric Motor-Drive Systems | 3 |
| ELEN 4220 | Power Electronics for Renewable Energy Systems | 3 |
| ELEN 4230 | Renewable and Legacy Electric Energy Systems Analysis | 3 |
| ELEN 4240 | Protection and Monitoring of Electric Energy Systems | 3 |
| ELEN 4250 | Transients in Electric Energy Systems and Devices | 3 |
| ELEN 4290 | Developments in Energy and Power | 1-3 |

Computer Hardware and Software

The computer hardware and software concentration provides courses that give a greater exposure to and more in-depth study of computer principles and applications. The emphasis in these courses is on small computers, particularly microcomputer concepts and applications. The following COEN and EECE courses are available in the Computer Hardware and Software area:

| Code | Title | Hours |
|-----------|---|-------|
| COEN 4620 | Modern Programming Practices | 3 |
| COEN 4630 | Software Testing | 3 |
| COEN 4710 | Computer Hardware | 3 |
| COEN 4720 | Embedded Systems Design | 3 |
| COEN 4730 | Computer Architecture | 3 |
| COEN 4820 | Operating Systems and Networking | 3 |
| COEN 4830 | Introduction to Computer Graphics | 3 |
| COEN 4840 | Computer Security | 3 |
| COEN 4850 | Introduction to Intelligent Systems | 3 |
| COEN 4860 | Introduction to Neural Networks and Fuzzy Systems | 3 |
| COEN 4870 | Evolutionary Computation | 3 |
| EECE 4410 | Introduction to Device Fabrication | 3 |

| | | |
|-----------|-------------------------------|---|
| EECE 4520 | Digital Image Processing | 3 |
| EECE 4740 | Advanced VHDL and FPGA Design | 3 |

Preparing for Graduate Study

The ELEN curriculum provides an excellent foundation for students wishing to pursue graduate studies in most electrical engineering graduate programs.

University Policies

- Academic Advising (<https://bulletin.marquette.edu/policies/academic-advising/>)
- Academic Censure - Undergraduate (<https://bulletin.marquette.edu/policies/academic-censure/undergraduate/>)
- Academic Integrity (<https://bulletin.marquette.edu/policies/academic-integrity/>)
- Academic Misconduct (<https://bulletin.marquette.edu/policies/academic-misconduct-policy/>)
- Academic Program Definitions (<https://bulletin.marquette.edu/policies/academic-programs-defined/>)
- Academic Standing (<https://bulletin.marquette.edu/policies/academic-standing/>)
- Accelerated Degree Programs (<https://bulletin.marquette.edu/policies/accelerated-degree-programs/>)
- Advanced Standing Credit - Undergraduate (<https://bulletin.marquette.edu/policies/advanced-standing-undergraduate/>)
- Attendance - Undergraduate (<https://bulletin.marquette.edu/policies/attendance/undergraduate/>)
- Audit - Undergraduate (<https://bulletin.marquette.edu/policies/audit/>)
- Awarding Diplomas and Certificates (<https://bulletin.marquette.edu/policies/awarding-diplomas-certificates/>)
- Background Checks, Drug Testing (<https://bulletin.marquette.edu/policies/background-checks-drug-testing/>)
- Class Rank (<https://bulletin.marquette.edu/policies/class-rank/>)
- Classification - Undergraduate (<https://bulletin.marquette.edu/policies/classification-undergraduate/>)
- Commencement (<https://bulletin.marquette.edu/policies/commencement/>)
- Conferral of Degrees and Certificates (<https://bulletin.marquette.edu/policies/conferral-degrees-certificates/>)
- Course Levels (<https://bulletin.marquette.edu/policies/course-levels/>)
- Credit Hour (<https://bulletin.marquette.edu/policies/credit/>)
- Credit Load - Undergraduate (<https://bulletin.marquette.edu/policies/credit-load/undergraduate/>)
- Examinations (Midterm and Final) - Undergraduate (<https://bulletin.marquette.edu/policies/examinations-midterm-final-undergraduate/>)
- Faculty Grading (<https://bulletin.marquette.edu/policies/faculty-grading/>)
- Family Education Rights and Privacy Act-FERPA (<https://bulletin.marquette.edu/policies/ferpa/>)
- Grade Appeals (<https://bulletin.marquette.edu/policies/grade-appeals/>)
- Grading System - Undergraduate and Health Science Professional (<https://bulletin.marquette.edu/policies/grading-system/undergraduate-healthscienceprofessional/>)
- Graduation - Undergraduate (<https://bulletin.marquette.edu/policies/graduation/undergraduate/>)
- Immunization and Tuberculosis Screening Requirements (<https://bulletin.marquette.edu/policies/immunization-and-tuberculosis-screening/>)
- Last Date of Attendance/Activity (<https://bulletin.marquette.edu/policies/last-dateof-attendance-activity/>)
- Major and Minor Declaration - Undergraduate (<https://bulletin.marquette.edu/policies/major-declaration/>)
- Medical Withdrawal (<https://bulletin.marquette.edu/policies/medical-withdrawal/>)
- Military Call to Active Duty or Training (<https://bulletin.marquette.edu/policies/militarycall-active-duty-training/>)
- Non-Degree Undergraduate Students (<https://bulletin.marquette.edu/policies/non-degree-undergraduate-students/>)
- Readmission - Undergraduate (<https://bulletin.marquette.edu/policies/readmission/>)
- Registration - Undergraduate (<https://bulletin.marquette.edu/policies/registration/undergraduate/>)
- Repeated Courses - Undergraduate (<https://bulletin.marquette.edu/policies/repeated-courses/undergraduate/>)
- Second Language Course Placement - Undergraduate (<https://bulletin.marquette.edu/policies/second-language-course-placement-undergraduate/>)
- Second/Additional Bachelor Degree (<https://bulletin.marquette.edu/policies/second-additional-bachelor-degree/>)
- Student Data Use and Privacy (<https://bulletin.marquette.edu/policies/student-data-use-privacy/>)
- Study at Other Institutions - Undergraduate (<https://bulletin.marquette.edu/policies/study-institutions/>)
- Transcripts-Official (<https://bulletin.marquette.edu/policies/transcripts-official/>)
- Transfer (Internal) to Another Undergraduate College within the University (<https://bulletin.marquette.edu/policies/transfer-internal-another-undergraduate-college-within-university/>)
- Transfer Course Credit - Undergraduate (<https://bulletin.marquette.edu/policies/transfer-course-credit-policy/undergraduate/>)
- Withdrawal - Undergraduate (<https://bulletin.marquette.edu/policies/withdrawals/undergraduate/>)

College of Engineering Policies

- Absence from Final Exams, Incomplete (I) Grade (<https://bulletin.marquette.edu/engineering/policies/absence-finals-incomplete-grade/>)
- Academic Dismissal/Probation/College Academic Alert (CAA) (<https://bulletin.marquette.edu/engineering/policies/dismissal-probation-college-alert/>)
- Academic Integrity (<https://bulletin.marquette.edu/engineering/policies/academic-integrity/>)
- Academic Load (<https://bulletin.marquette.edu/engineering/policies/academic-load/>)
- Accreditation (<https://bulletin.marquette.edu/engineering/policies/accreditation/>)
- Admission Requirements (<https://bulletin.marquette.edu/engineering/policies/admission-requirements/>)
- Articulation Agreements (<https://bulletin.marquette.edu/engineering/policies/articulation-agreements/>)
- Course and Grade Limitations (<https://bulletin.marquette.edu/engineering/policies/course-grade-limitations/>)
- Credit/No Credit (CR/NC) Grading Option (<https://bulletin.marquette.edu/engineering/policies/credit-no-credit-grading-option/>)
- Curriculum Substitution and/or Allowance Petition (<https://bulletin.marquette.edu/engineering/policies/curriculum-substitution-allowance-petition/>)
- Dean's List (<https://bulletin.marquette.edu/engineering/policies/deans-list/>)
- Degrees Offered (<https://bulletin.marquette.edu/engineering/policies/degrees-offered/>)
- Electives (<https://bulletin.marquette.edu/engineering/policies/electives/>)
- Grade Appeals for Engineering Courses (<https://bulletin.marquette.edu/engineering/policies/grade-appeals-engineering-courses/>)
- Repeating Courses (<https://bulletin.marquette.edu/engineering/policies/repeating-courses/>)
- Simultaneous Enrollment in Two Academic Programs (<https://bulletin.marquette.edu/engineering/policies/simultaneous-enrollment-two-academic-programs/>)
- Transfer Credit from Other Programs (<https://bulletin.marquette.edu/engineering/policies/transfer-credit-programs/>)
- Undergraduate Independent Study (<https://bulletin.marquette.edu/engineering/policies/undergraduate-independent-study/>)