Department of MATHEMATICS & ENGINEERING

Science, mathematics, and engineering exert more influence on our society than ever before. Advances of the past century have been truly astounding—consider manned flight in the atmosphere and outer space, the development of computers and their applications, and the fabrication and use of new materials, to name a very few. Mathematics was one of the very first subjects in the formal curriculum of western universities, and the application of mathematics, facilitated by computers, is poised to expand exponentially in the future. Artisans and craftsmen of long ago were the forerunners of modern engineers, who now employ mathematics and creativity to solve problems in modern societies.

The Department of Mathematics & Engineering offers a degree in mathematics, and students may pursue degrees in engineering in cooperation with the University of Minnesota. The sciences, mathematics, and engineering, like all other disciplines at Northwestern College, are presented in the context of a Biblical worldview, which is integrated into every course.

NOTE: WHEN A STUDENT RECEIVES A "U" GRADE FOR THE LAB PORTION OF A SCIENCE COURSE, HE/SHE RECEIVES CREDIT FOR THE COURSE, BUT THE COURSE DOES NOT COUNT FOR LABORATORY SCIENCE CREDIT IN CORE CURRICULUM.

Engineering Dual Degree Program COOPERATIVE PROGRAM WITH THE UNIVERSITY OF MINNESOTA

Northwestern College has a cooperative agreement with the Institute of Technology at the University of Minnesota-Twin Cities. In this program a student typically completes a prescribed three-year course of study with either an applied mathematics or engineering sciences emphasis at Northwestern College, transfers to the Institute of Technology, and completes the requirements for an engineering degree there. Although this usually requires two years of full-time study at the University, some additional course work, such as summer school courses, may be required. Upon completion of the engineering degree requirements at the University, a student earns a bachelor's degree in engineering from the University of Minnesota and a bachelor's degree in applied mathematics or engineering sciences from Northwestern College.

The emphasis that a student elects to pursue, either applied mathematics or engineering sciences, will depend on the student's interests and the requirements for a particular engineering discipline. Students interested in the Dual Degree programs are strongly encouraged to meet with a Northwestern College engineering advisor for guidance.

To enroll in any PHY or EGR course, students must receive a grade of "C" or better in all prerequisite courses. Courses with grades below "C" must be repeated.

Engineering Sciences Emphasis

- **Natural World** courses in core curriculum must include MAT2121 and PHY1201/1201L.

Required Courses . . . . . 43 cr

EGR1005	Introduction to Engineering	4
MAT2122	Calculus and Analytic Geometry II	4
MAT2215	Linear Algebra	3
MAT3223	Calculus and Analytic Geometry III	4
MAT3335	Ordinary Differential Equations	4
MAT4335	Computer-aided Mathematics **or** EGR2235 C/C++ Programming Language for Science and Engineering	4
PHY1202	Engineering Physics II	4

Select 16 credits from the following in consultation with a Northwestern College advisor: BIO1011 or higher, CHE1021 or higher, EGR2316 or higher, MAT3252 or higher, or PHY2203 or higher.

Applied Mathematics Emphasis

- **Natural World** courses in core curriculum must include MAT2121 and PHY1201/1201L.

Required courses . . . . . 43 cr

EGR1005	Introduction to Engineering	4
MAT2122	Calculus and Analytic Geometry II	4
MAT2215	Linear Algebra	3
MAT2225	Foundations of Mathematics	4
MAT3223	Calculus and Analytic Geometry III	4
MAT3251	Probability **or** MAT3252 Calculus-based Statistics	4
MAT3335	Ordinary Differential Equations	4
MAT4335	Computer-aided Mathematics **or** EGR2235 C/C++ Programming Language for Science and Engineering	4
MAT4337	Mathematical Models and Applications	4
MAT4339	Numerical Analysis	4
PHY1202	Engineering Physics II	4

Engineering Studies

A degree program in engineering studies is available upon recommendation by the Department of Mathematics & Engineering. Courses are chosen in consultation with the student's academic advisor or the Chair of the Department of Mathematics & Engineering. Upon successful completion of the course of study, the student is awarded a bachelor of science degree in applied science and mathematics.

Mathematics Major Bachelor of Science

The Mathematics major is designed to meet the increasing need for mathematicians in areas of science and technology and to prepare students for graduate study in mathematics. The Mathematics major has two options: the Applied Program, for preparation to apply mathematics in areas of science, business, and technology; and the Traditional Program, for preparation for mathematics research and graduate school. The degree is granted upon completion of 125 credits as specified on pages 41–42 (40 credits must be in 3000- or 4000-level courses).

Mathematics Core . . . . . 35 cr

MAT2005	Problem Solving	2
MAT2122	Calculus and Analytic Geometry II	4
MAT2215	Linear Algebra	3
MAT2216	Introduction to MATLAB	1
MAT2225	Foundations of Mathematics	4
MAT3223	Calculus and Analytic Geometry III	4
MAT3225	Discrete Mathematics **or** MAT2075 History of Mathematics	2
MAT3251	Probability **or** MAT3252 Calculus-based Statistics	4
MAT3335	Ordinary Differential Equations	4
MAT3835	Career Competencies Seminar	1
MAT4845	Senior Project **[WCE, OCE]**	2
Select one course from the following:		
EGR2235	C/C++ Programming Language for Science and Engineering	4
MAT4335	Computer-aided Mathematics	4
MAT4995	Mathematics Internship	4
MIS3272	Programming II	4

WCE = WRITTEN COMMUNICATION EMPHASIS.
OCE = ORAL COMMUNICATION EMPHASIS.
SEE PAGE 39 FOR EXPLANATION AND PREREQUISITES.

Applied Program

- **Natural World** courses in core curriculum must include MAT2121.

Required Courses . . . . . 16 cr

MAT4337	Mathematical Models and Applications	4
MAT4339	Numerical Analysis	4
Related Field Electives		8

All 8 credits of electives must be chosen from one of the following disciplines, in consultation with the academic advisor; in addition, students are strongly encouraged to complete a minor, where available, in the discipline in which the 8 credits are fulfilled:

- Accounting
- Biology
- Chemistry
- Design
- Finance
- Management
- Management Info. Systems
- Marketing
- Physics

Traditional Program

- **Natural World** courses in core curriculum must include MAT2121 and PHY1201.

Required Courses . . . . . 16 cr

MAT3211	Abstract Algebra I	4
MAT3245	Modern Geometry	4
Mathematics Electives		8

CHOOSE MAT COURSES (MAT2825 OR HIGHER) NOT COUNTED ABOVE

Mathematics Minor . . . . . 21 cr

- **Natural World** courses in core curriculum must include MAT2121.

Required Courses: MAT2005 or MAT2075 or MAT3225, 2122, 2215, 2225; eight credits selected from MAT2825 or upper-level courses with MAT prefix.

Mathematics Education Major Bachelor of Science

Full details are given under Department of Education programs. See pages 75–79 and 86.

Chemistry Minor . . . . . 22–23 cr

Required Courses: CHE1021, CHE1022, CHE3101; two courses selected from CHE3102, CHE3321, BIO3231, BIO3232.

Science Minor . . . . . 20 cr

- **Natural World** courses in core curriculum must include MAT2025 or MAT2055 or higher and either BIO1011, CHE1021, or PHY1101.
- **Twenty credits** in courses with BIO, CHE, or PHY prefixes in addition to the Natural World science course requirement.

Pre-Engineering

Students may select courses at Northwestern College to meet the lower-division requirements of another college or university which offers a degree in some field of engineering. A listing of such courses is given below. In addition, the student should select courses to satisfy the core curriculum requirements of the institution to which he/she will be transferring. The student is requested to secure program requirements of his/her intended engineering institution in order to work effectively with the pre-engineering advisor at Northwestern College. In addition, pre-engineering students are highly encouraged to enroll in those Bible courses that will transfer to other institutions.

Courses		Credits
CHE1021	Principles of Chemistry I	4
CHE1022	Principles of Chemistry II	4
CHE3101	Organic Chemistry I & Lab	5
CHE3102	Organic Chemistry II & Lab	5
CHE3321	Physical Chemistry I	4
EGR1005	Introduction to Engineering	4
EGR2235	C/C++ Programming Language for Science and Engineering	4
EGR2316	Statics and Dynamics	4
EGR2325	Introduction to Electronic and Electrical Circuits	3
EGR2326	Electronics and Electrical Circuits Laboratory	1
EGR3175	Introduction to the Science of Engineering Materials	4
EGR3265	Mechanics of Materials	4
EGR3311	Thermodynamics	4
MAT2121	Calculus and Analytic Geometry I	4
MAT2122	Calculus and Analytic Geometry II	4
MAT2215	Linear Algebra	3
MAT3223	Calculus and Analytic Geometry III	4
MAT3335	Ordinary Differential Equations	4
PHY1201	Engineering Physics I	4
PHY1202	Engineering Physics II	4
PHY2203	Engineering Physics III	4