

# GENERAL ENGINEERING

## Introductory and General Engineering Courses

### Required Introductory Courses

**DSGN 106-1 Design Thinking and Communication (0.5 Unit)** Integrated introduction to the user-centered design process and technical communication. Students will address challenges proposed by project partners by identifying unmet needs, conducting research, generating and evaluating potential solutions, and finally, presenting a final design concept with supporting documentation. Students also enhance their abilities in equitable teamwork, project management, fabrication skills, and producing written, oral, graphical, and interpersonal communication. One lecture, two section meetings, and lab. Co-registration with ENGLISH 106-1 required. Primarily intended for first-year engineering students.

**DSGN 106-2 Design Thinking and Communication (0.5 Unit)** Integrated iteration on the user-centered design process and technical communication. This course will build on the learning objectives from DTC-1 while adding more focus on ethics in design and communication, equitable distribution of teamwork, project management, documenting and communicating progress, and exploring a wider variety of project topics. One lecture, two section meetings, and lab. Co-registration with ENGLISH 106-2 required. Primarily intended for first-year engineering students.

**GEN\_ENG 205-1 Engineering Analysis I (1 Unit)** Introduction to linear algebra from computational, mathematical, and applications viewpoints. Computational methods using a higher-level software package such as MATLAB.

**GEN\_ENG 206-1 Honor Engineering Analysis (1 Unit)** Covers topics addressed in GEN\_ENG 205-1 at a deeper level. Intended for students with demonstrated strength in mathematics, computer programming, and/or physics. Prerequisite: consent of instructor.

**GEN\_ENG 205-2 Engineering Analysis II (1 Unit)** Linear algebra and introduction to vector methods in engineering analysis. Statics and dynamics of rigid bodies and matrix analysis of trusses and networks. Engineering design problems. Prerequisites: C- or better in GEN\_ENG 205-1; MATH 220-1.

**GEN\_ENG 205-3 Engineering Analysis III (1 Unit)** Dynamic behavior of the elements. Modeling of mechanical (both translational and rotational), electrical, thermal, hydraulic, and chemical systems composed of those elements. Prerequisite: C- or better in GEN\_ENG 205-2.

**GEN\_ENG 205-4 Engineering Analysis IV (1 Unit)** Solution methods for ordinary differential equations, including exact, numerical, and qualitative methods. Applications and modeling principles; solution techniques. Prerequisites: C- or better in GEN\_ENG 205-2; MATH 220-2.

**GEN\_ENG 206-4 Honors Engineering Analysis IV (1 Unit)** Covers topics addressed in GEN\_ENG 205-4 at a deeper level. Intended for students with demonstrated strength in mathematics, computer programming, and/or physics. Prerequisite: consent of instructor.

### Optional General Engineering Courses

**GEN\_ENG 190-0 Engineering Freshman Seminar (0-1 Unit)** Broad engineering or interdisciplinary subjects of current interest.

**GEN\_ENG 205-MG-2 Midquarter Study Group: GEN\_ENG 205-2 Engineering Analysis II (0 Unit)** Peer-guided study group for students

enrolled in GEN\_ENG 205-2. Meets weekly, starting at midquarter, in small groups along with a peer facilitator, to collaboratively review material, work through practice problems, and clarify course concepts. Enrollment optional. Graded S/U.

**GEN\_ENG 205-SG-1 Peer-Guided Study Group: Engineering Analysis I (0 Unit)** Peer-guided study group for students enrolled in GEN\_ENG 205-1. Meets weekly in small groups, along with a peer facilitator, to collaboratively review material, work through practice problems, and clarify course concepts. Enrollment optional. Graded S/U.

**GEN\_ENG 205-SG-2 Peer-Guided Study Group: Engineering Analysis II (0 Unit)** Peer-guided study group for students enrolled in GEN\_ENG 205-2. Meets weekly in small groups, along with a peer facilitator, to collaboratively review material, work through practice problems, and clarify course concepts. Enrollment optional. Graded S/U.

**GEN\_ENG 205-SG-3 Peer-Guided Study Group: Engineering Analysis III (0 Unit)** Peer-guided study group for students enrolled in GEN\_ENG 205-3. Meets weekly in small groups, along with a peer facilitator, to collaboratively review material, work through practice problems, and clarify course concepts. Enrollment optional. Graded S/U.

**GEN\_ENG 205-SG-4 Peer-Guided Study Group: Engineering Analysis IV (0 Unit)** Peer-guided study group for students enrolled in GEN\_ENG 205-4. Meets weekly in small groups, along with a peer facilitator, to collaboratively review material, work through practice problems, and clarify course concepts. Enrollment optional. Graded S/U.

**GEN\_ENG 220-1 Analy/Comp Graph (0.5 Unit)** Introduction to AutoCAD, geographic information systems (GIS), and electronic surveying and measuring.

**GEN\_ENG 220-2 Analy/Comp Graph II (0.5 Unit)** Introduction to AutoCAD, geographic information systems (GIS), and electronic surveying and measuring.

**GEN\_ENG 295-0 Special Topics in Engineering (1 Unit)** Intermediate-level topics suggested by students or faculty members and approved by the curriculum committee.

**GEN\_ENG 355-0 Domestic Study Affiliated (0 Unit)** Fulltime registration in an academic program in the continental United States that is affiliated with Northwestern. Upon successful completion of the program, registration is replaced with credits transferred from the affiliated institution.

**GEN\_ENG 395-0 Special Topics in Engineering (1 Unit)** Topics suggested by faculty and approved by the curriculum committee.

**GEN\_ENG 397-0 Selected Topics in Engineering (0.5 Unit)** Topics of limited scope as suggested by faculty and approved by the curriculum committee.

**GEN\_ENG 399-0 Independent Study (1 Unit)** Independent study on an engineering subject supervised by a faculty member and concluding with a final report.

### Murphy Institute General Engineering Courses

- Participation in the Murphy Institute and its courses is by invitation only. Additional information can be found on the Murphy Institute website: <https://www.mccormick.northwestern.edu/academics/undergraduate/programs/honors-and-combined-degrees/murphy-scholars/>

**GEN\_ENG 195-1 Engineering Dialog I (0.33-0.34 Unit)** Weekly seminar addressing subjects of interest in engineering, design, engineering policy, and entrepreneurial activities. For participants in the invitation-only Murphy Institute Scholars Program. May be repeated.

**GEN\_ENG 196-1 Engineering Discourse I (0 Unit)** Noncredit counterpart to GEN\_ENG 195-1.

**GEN\_ENG 195-2 Engineering Dialog II (0.33-0.34 Unit)** Weekly seminar addressing subjects of interest in engineering, design, engineering policy, and entrepreneurial activities. For participants in the invitation-only Murphy Institute Scholars Program. May be repeated.

**GEN\_ENG 196-2 Engineering Discourse II (0 Unit)** Noncredit counterpart to GEN\_ENG 195-2.

**GEN\_ENG 195-3 Engineering Dialog III (0.33-0.34 Unit)** Weekly seminar addressing subjects of interest in engineering, design, engineering policy, and entrepreneurial activities. For participants in the invitation-only Murphy Institute Scholars Program. May be repeated.

**GEN\_ENG 196-3 Engineering Discourse III (0 Unit)** Noncredit counterpart to GEN\_ENG 195-3.

**GEN\_ENG 195-4 Engineering Dialog IV (0.33-0.34 Unit)** Weekly seminar addressing subjects of interest in engineering, design, engineering policy, and entrepreneurial activities. For participants in the invitation-only Murphy Institute Scholars Program. May be repeated.

**GEN\_ENG 196-4 Engineering Discourse IV (0 Unit)** Noncredit counterpart to GEN\_ENG 195-4.

## Engineering Career Development

The mission of Engineering Career Development (ECD) is to provide all McCormick students with the tools necessary for lifelong career management and to forge relationships with employer partners for this end.

Engineering Career Development offers students:

- Courses and workshops designed to aid students in preparing and conducting a job search
- Personalized, one-on-one career advising
- Employer events and on campus interviewing opportunities
- Work integrated learning programs that allow students to maintain their student status while enrolling in zero-credit, zero-tuition courses for co-op, internship, research, and service learning experiences.

For more information visit: [www.mccormick.northwestern.edu/career-development/](http://www.mccormick.northwestern.edu/career-development/) (<https://www.mccormick.northwestern.edu/career-development/>)

## Engineering Career Development Course Offerings

### Introductory Coursework

**CRDV 301-0 Introduction to Career Development (0 Unit)** Course preparing students for the Walter P. Murphy Cooperative Engineering Education Program, internships, and fulltime employment. It includes units on job-search skills, self-assessment, transition to the workplace, workplace-management issues, and transition back to school.

### Cooperative Engineering Courses

- All courses in the CRDV 310 sequence are 0 credit.
- Sequence of courses covering the work terms of students in the Walter P. Murphy Cooperative Engineering Education Program.

Course	Title
CRDV 310-1 or CRDV 310-1-GM	Cooperative Engineering Education International Cooperative Engineering Education
CRDV 310-2 or CRDV 310-2-GM	Cooperative Engineering Education International Cooperative Engineering Education

CRDV 310-3 or CRDV 310-3-GM	Cooperative Engineering Education International Cooperative Engineering Education
CRDV 310-4 or CRDV 310-4-GM	Cooperative Engineering Education International Cooperative Engineering Education
CRDV 310-5 or CRDV 310-5-GM	Cooperative Engineering Education International Cooperative Engineering Education
CRDV 310-6 or CRDV 310-6-GM	Cooperative Engineering Education International Cooperative Engineering Education
CRDV 310-7 or CRDV 310-7-GM	Cooperative Engineering Education: Half-time International Cooperative Engineering Education: Half-Time

### Engineering Internship Courses

- All courses in the CRDV 311 sequence are 0 credit.
- Series of courses designated for students seeking University recognition of their internship experience, or participating in an approved internship during the regular academic year.

Course	Title
CRDV 311-1 or CRDV 311-1-GM	Professional Engineering Internship International Engineering Internship
CRDV 311-2 or CRDV 311-2-GM	Professional Engineering Internship International Engineering Internship
CRDV 311-3 or CRDV 311-3-GM	Professional Engineering Internship International Engineering Internship
CRDV 311-7 or CRDV 311-7-GM	Engineering Internship: Half-time International Engineering Internship: Half-Time

### Engineering Projects in Service Learning Courses

- All courses in the CRDV 312 sequence are 0 credit.
- CRDV 312 courses require students to engage in an engineering-related, full-time community service project under the guidance of an appropriate faculty member, agency supervisor or mentor.

Course	Title
CRDV 312-1 or CRDV 312-1-GM	Undergraduate Engineering Projects in Service Learning International Engineering Service Learning
CRDV 312-2 or CRDV 312-2-GM	Undergraduate Engineering Projects in Service Learning International Engineering Service Learning
CRDV 312-3 or CRDV 312-3-GM	Undergraduate Engineering Projects in Service Learning International Engineering Service Learning
CRDV 312-7 or CRDV 312-7-GM	Engineering Projects in Service Learning: Half-time International Engineering Service Learning: Half-Time

### Undergraduate Engineering Research Courses

- All courses in the CRDV 313 sequence are 0 credit.
- The CRDV 313 course sequence allows students to maintain half-time enrollment at Northwestern while engaged full-time in an University-based research project under the supervision of a faculty research sponsor. Students are evaluated by ABET criteria, the same as those in the Walter P. Murphy Cooperative Engineering Education Program and the Professional Engineering Internship Program.

Course	Title
CRDV 313-1 or CRDV 313-1-GM	Undergraduate Engineering Research International Engineering Research Experience
CRDV 313-2	Undergraduate Engineering Research

or CRDV 313-2-GM	International Engineering Research Experience
CRDV 313-3	Undergraduate Engineering Research
or CRDV 313-3-GM	International Engineering Research Experience
CRDV 313-7	Engineering Research Experience: Half-time
or CRDV 313-7-GM	International Engineering Research Experience: Half-Time

## Northwestern Personal Development StudioLab

The Northwestern Personal Development StudioLab is a space where students create and practice their personal and powerful life approach. The StudioLab collaborates with partners across campus and beyond to develop and deliver courses, opportunities, resources, and experiences that promote the personal growth of students. The StudioLab strives to cultivate a student body who possess:

- The ability to be intentional with their attention.
- Accurate awareness of themselves, their peers, and the world around them.
- Healthy connections to the present moment, to themselves, and to those around them.

The StudioLab offers the *Curious Life Certificate* (CLC), a series of classes that develops these qualities as the foundation for a successful and curious life.

For more information visit [www.mccormick.northwestern.edu/personal-development-studiolab/](http://www.mccormick.northwestern.edu/personal-development-studiolab/) (<https://www.mccormick.northwestern.edu/personal-development-studiolab/>)

## Engineering Office of Personal Development Course Offerings

**PRDV 101-1 McCormick First-Year Experience (0 Unit)** A series of peer-led small group discussions for first-year engineering students, covering topics like higher education culture, time management, strategies for success in courses, and mindset. Attendance is required.

**PRDV 101-2 McCormick First-Year Experience (0 Unit)** A series of peer-led small group discussions for first-year engineering students covering topics such as academic strategies, choice of major, exploration of non-major options, and health and well-being. Attendance is required.

**PRDV 200-0 PATH (Personal Development Studio Lab) (0 Unit)** PATH explores opportunities to improve performance on many different levels. Students will begin with a values assessment and set short term goals, then explore the role of attention, mindset, learning science, time management and self-compassion in achieving personal, academic, and future professional success. PATH is a prerequisite for the Curious Life Certificate.

**PRDV 300-0 Designing Your Life (1 Unit)** Considers an approach to life as a series of design projects to help students craft a total life. Includes seminar-style discussions, role-playing, short writing assignments, hands-on making, guest speakers, and individual mentoring and coaching. Prerequisite: Reserved for Juniors and Seniors.

**PRDV 325-0 Emotional Intelligence 101 - Managing Yourself, Maximizing Your Potential (1 Unit)** Introduction to emotional intelligence theories and concepts; provides practical tools for building skills in stress management, intrapersonal and interpersonal awareness, peak performance, resilience/adaptability, and general mood.

**PRDV 335-1 Engineering Improv I: The Art of Allowing (0.5 Unit)** Start anywhere, remember you are not the most important person in the scene,

and say yes. Through these and other improv techniques, students learn to tackle unexpected obstacles, building skills that can be leveraged in both academic and non-academic contexts to face challenges with resilience.

**PRDV 335-2 Engineering Improv II: The Art of Application (0.5 Unit)** This course builds on Improv I and takes students deeper into concepts and applications. Prerequisite: PRDV 335-1 Engineering Improv I.

**PRDV 345-0 Whole-Body Thinking: Collaborative Problem Solving through Partner Dancing (1 Unit)** In this approach to swing dancing, the goal is for two people to join hands and use the rhythms they hear in swinging, jazz-rhythm-based music as a means of connecting with each other.

**PRDV 395-0 Special Topics in Personal Development (1 Unit)** Topics suggested by students or faculty and approved by the curriculum committee. Prerequisite: consent of instructor.

**PRDV 396-0 Topics in Personal Development (0 Unit)** Topics of limited scope as suggested by faculty or students and approved by the McCormick Office of Personal Development.

**PRDV 397-0 Selected Topics in Personal Development (0.5 Unit)** Topics of limited scope as suggested by faculty or students and approved by the McCormick Curriculum Committee.

## Northwestern Institute on Complex Systems

The Northwestern Institute on Complex Systems (NICO) was founded in 2004 with the goals of uncovering fundamental principles governing complex systems in science, technology, and human behavior and applying these principles to solve societally relevant problems through the analysis, design, and control of complex systems. Today, NICO serves as a hub and facilitator for pathbreaking research in complexity and data science transcending the boundaries of established disciplines. NICO is a collaboration between the McCormick School of Engineering and the Kellogg School of Management.

## Northwestern Institute on Complex Systems Course Offerings

**NICO 101-0 Introduction to Programming for Big Data (0.67 Unit)** The skills needed to go from data to knowledge and application, which go under the name of Data Science, are in big demand in industry, government, and academia. This course provides an introduction to the foundational skills needed by data scientists. Prior knowledge of programming is not needed.

**NICO 102-0 Project for Introduction to Programming for Big Data (0.33 Unit)** The skills needed to go from data to knowledge and application, which go under the name of Data Science, are in big demand in industry, government, and academia. This course provides an opportunity to develop programming skills by working on a data centered project. *Formal Studies Distro Area*