# ENGINEERING LEADERSHIP MINOR

## Overview and Purpose

The engineering leadership minor provides students an opportunity to focus on building leadership, management, and interpersonal skills needed to solve many of our societal challenges. Students complete a series of leadership, project management and interpersonal skills courses using experiential learning strategies and combine subject area knowledge gained in courses from their majors with strategies and skills to effectively lead in the engineering profession.

Courses included in the minor are leadership courses developed for the minor and focus on leadership, management and interpersonal skill needs of engineering students as well as courses lead by the faculty in the Department of Agricultural Leadership, Education and Communication.

This minor is intended to serve students in the College of Engineering. The minor contributes to the National Academy of Engineers call to expose engineering students to formal studies of leadership development (NAE, 2004) and the College of Engineering's mission to graduate the 'Complete Engineer.'

## Eligibility

Open to students in the College of Engineering only.

## Requirements

The engineering leadership minor is an interdisciplinary program; providing course offerings through the College of Engineering (COE) and the Department of Agricultural Leadership, Education and Communication (ALEC) at the University of Nebraska - Lincoln (UNL). To successfully complete the minor, students are required to complete 18 credit hours in leadership and professional development; 9 of which come from engineering leadership and management courses. Many of the ALEC courses are available as online courses. All ALEC courses are taught at the UNL.

## Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ENGR Leadership &amp; Management Courses (9 credit hours required)</td>
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<tr>
<td>ENGR 1000</td>
<td>INTERPERSONAL SKILLS FOR ENGINEERING LEADERS (ACE 2)</td>
<td>3</td>
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<tr>
<td>ENGR 2000</td>
<td>PROFESSIONALISM &amp; GLOBAL PERSPECTIVE (ACE 6 &amp; 9)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 3200</td>
<td>LEADERSHIP, MANAGEMENT, AND ETHICS (ACE 6 &amp; 8)</td>
<td>3</td>
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<tr>
<td>Leadership Courses (9 credit hours required)</td>
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<tr>
<td>Select one or two theory-based courses from the following:</td>
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<tr>
<td>ALEC 202</td>
<td>FOUNDATION OF LEADERSHIP THEORY &amp; PRACTICE</td>
<td>1</td>
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<tr>
<td>ALEC 302</td>
<td>DYNAMICS OF EFFECTIVE LEADERSHIP IN ORGANIZATIONS</td>
<td>1</td>
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<tr>
<td>ALEC 433</td>
<td>DYNAMICS OF EFFECTIVE LEADERSHIP IN GROUPS &amp; TEAMS</td>
<td>1</td>
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<tr>
<td>ALEC 477</td>
<td>LEADERSHIP &amp; MOTIVATION</td>
<td>1</td>
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<td>Select one or two application courses from the following:</td>
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<tr>
<td>ALEC 407</td>
<td>SUPERVISORY LEADERSHIP</td>
<td>1</td>
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<tr>
<td>ALEC 410</td>
<td>ENVIRONMENTAL LEADERSHIP</td>
<td>1</td>
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<tr>
<td>ALEC 422</td>
<td>FACILITATION &amp; PROJECT PLANNING</td>
<td>1</td>
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</table>

## Experiential Learning in Leadership (0 - 3 cr hrs)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ALEC 466</td>
<td>LEADERSHIP &amp; DIVERSITY IN ORGANIZATIONS &amp; COMMUNITIES</td>
<td>1</td>
</tr>
<tr>
<td>ALEC 337</td>
<td>INSTRUCTIONAL INTERNSHIP IN LEADERSHIP DEVELOPMENT</td>
<td>2</td>
</tr>
</tbody>
</table>

## Additional Minor Requirements

All courses must be completed with a Pass, or grade of C or higher.

Up to 6 credit hours may be taken as Pass/No Pass.

**ENGR 100 FRESHMAN ENGINEERING SEMINAR (0 credits)**

Overview of the engineering field as well as major specific information. Information will be provided to help with transitional needs to UNL and the college of engineering (time management, study skills, and resources), involvement opportunities (student organizations, research, and study abroad, tours of engineering facilities for experiential learning, and interactive learning to increase business knowledge and skills).

**Prerequisite(s)/Corequisite(s):** Not open to non-degree graduate students.

**ENGR 150 SPATIAL VISUALIZATION TRAINING (0 credits)**

Develop and improve spatial visualization skills.

**ENGR 200 SOPHOMORE VISUALIZATION TRAINING (0 credits)**

Overview of career opportunities in engineering and construction management. Emphasizes internships, cooperative education and career placement.

**Prerequisite(s)/Corequisite(s):** Not open to non-degree graduate students.

**ENGR 1000 INTERPERSONAL SKILLS FOR ENGINEERING LEADERS (3 credits)**

Establishes a foundation in communication and leadership skills that is needed for engineering students to be successful in their academic endeavors and future career opportunities. Introduction to the principles and practices of positive interpersonal relationships for leadership development. Self-awareness, awareness of others, effective interpersonal communication, and the building of trust relationships as a basis for understanding and developing leadership.

**Prerequisite(s)/Corequisite(s):** Not open to non-degree graduate students.

**ENGR 1010 INTRODUCTION TO ENGINEERING (3 credits)**

Students will examine relevant and practical industrial and commercial engineering applications to gain necessary engineering skills that will help them succeed as a student as well as a professional engineer. A variety of engineering disciplines will be highlighted and discussed, as well as topics in the underlying physical, chemical, and biological scientific principles and processes related to each topic. The class will use a specified focus area that involves real world applications to aid in the conceptualization and learning of the course material. Students will develop engineering problem solving skills; gain expertise and experience using modern engineering and computational tools; and emulate an engineering team atmosphere - each of which can be applied to a profession engineering environment.

**ENGR 1910 FRESHMAN ENGINEERING SPECIAL TOPICS (1-3 credits)**

Topics vary.

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1. Note that junior standing is required for these courses.
2. Credit received for being an undergraduate teaching assistant at the selection of the instructor.
ENGR 2000 PROFESSIONALISM & GLOBAL PERSPECTIVE (3 credits)
Enhance essential professional skills for personal and team success through investigating issues in a global context. Explore in-demand professional aptitudes (self-awareness, emotional intelligence, teamwork, communication, and workplace interaction expectations). Through industry/community interaction, explore cultural and business norms and the application of broader perspectives to identify issues/solutions responsive and adaptive to their global context.

ENGR 2500 ENGINEERING COOPERATIVE EDUCATION (1-12 credits)
Cooperative education work in a regularly established cooperative education work-study program in any engineering curriculum. Special approval is required to take course for credit hours. C/N only.
Prerequisite(s)/Corequisite(s): Sophomore standing; permission of College of Engineering Dean's Office and department chair of student's engineering major. All engineering students participating in cooperative education must register each term prior to commencing work.

ENGR 2910 SOPHOMORE ENGINEERING SPECIAL TOPICS (1-3 credits)
Topics vary.

ENGR 3000 CREATIVITY AND WRITING FOR ENGINEERS (3 credits)
Writing technical engineering reports; creative thinking and brainstorming applied to real engineering problem with individual solutions submitted in report form.
Prerequisite(s)/Corequisite(s): ENGL 1160 and Sophomore

ENGR 3010 INTRODUCTION TO NUCLEAR AND RADIATION ENGINEERING CONCEPTS (1 credit)
History of nuclear development, basic concepts of radiation and radioactivity, radioactive waste management, global warming, and the impact of nuclear power plants. Industrial applications, health, and nuclear medicine. Job opportunities at power plants, graduate school, and national laboratories. Tour of the University of Texas nuclear research reactor and demonstration experiments. (Requires off-campus travel.)
Prerequisite(s)/Corequisite(s): Not open to nondegree students

ENGR 3100 UTILIZATION OF NUCLEAR TECHNOLOGIES IN SOCIETY (3 credits)
The applications of nuclear science to society and the fundamental radiation principles utilized in these applications.
Prerequisite(s)/Corequisite(s): Not open to non-degree graduate students.

ENGR 3200 LEADERSHIP, MANAGEMENT, AND ETHICS (3 credits)
Explore professional leadership, ethics, project management tools and skills, and how to successfully implement and respond to change. In a team based environment, enhance essential professional skills for personal and team success by developing and presenting a responsive proposal considering: client needs, basic project controls and scheduling. Learn about personal styles, motivation and effectively implementing change. Examine ethical dilemmas regarding principles, stewardship, and civics from ethical, legal, and expediency perspectives.
Prerequisite(s)/Corequisite(s): Not open to non-degree graduate students.

ENGR 3500 ENGINEERING COOPERATIVE EDUCATION (1-12 credits)
Cooperative education work in a regularly established cooperative education work-study program in any engineering curriculum. Special approval is required to take course for credit hours. C/N only.
Prerequisite(s)/Corequisite(s): Junior standing; permission of College of Engineering Dean's Office and department chair of student's engineering major. All engineering students participating in cooperative education must register each term prior to commencing work.

ENGR 3910 JUNIOR ENGINEERING SPECIAL TOPICS (1-3 credits)
Topics vary.

ENGR 4000 PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY (1 credit)
Discussions on professionalism and ethics of engineering practice; problems encountered by new graduates.
Prerequisite(s)/Corequisite(s): Senior

ENGR 4020 ENERGY SYSTEMS AND RESOURCES (3 credits)
Energy as a critical component of civilization. The critical role of energy from the economic and political point of view world wide. Energy resources available, the technology to use the resources, the economics of energy production, the environmental consequences of energy use, and energy policy.
Prerequisite(s)/Corequisite(s): ENGR 3010, not open to nondegree students

ENGR 4070 PROJECT MANAGEMENT (3 credits)
Project development, role of the project manager, project selection, project planning, budgeting and cost estimation, project scheduling, and project termination.

ENGR 4100 RADIATION PROTECTION AND SHIELDING (3 credits)
Basic principles and concepts of radiation protection and shield design. Dosi-metric units and response functions, hazards of radiation doses, radiation sources, basic methods for dose evaluation, and shielding design techniques for photons and neutrons.
Prerequisite(s)/Corequisite(s): MENG 4010, MECH 4010 MENG 8016, MECH 8016 or ENGR 4210

ENGR 4110 NUCLEAR REACTOR THEORY (3 credits)
Introduction to neutron diffusion theory, neutron moderation, neutron thermalization, and criticality condition of nuclear reactor.
Prerequisite(s)/Corequisite(s): ENGR 3100, not open to nondegree students

ENGR 4120 NUCLEAR REACTOR ANALYSIS (3 credits)
Group diffusion method, multiregional reactors, heterogeneous reactors, reactor kinetics, and change in reactivity.
Prerequisite(s)/Corequisite(s): ENGR 4110, not open to nondegree students

ENGR 4150 COGNITIVE ERGONOMICS (3 credits)
Human factors affecting work. Focus on humans: energy requirements, lighting, noise, monotony and fatigue, learning, simulations versus sequential tasks. Experimental evaluation of concepts.
Prerequisite(s)/Corequisite(s): ENGR 4300 or permission.

ENGR 4160 PHYSICAL ERGONOMICS (3 credits)
Human performance in work. Human response to various environmental and task-related variables with emphasis on physical and physiological effects.
Prerequisite(s)/Corequisite(s): ENGR 4300 or permission

ENGR 4170 OCCUPATIONAL SAFETY HYGIENE ENGINEERING (3 credits)
Introduction to occupational hygiene engineering with emphasis on workplace environmental quality. Heat, illumination, noise, and ventilation.
Prerequisite(s)/Corequisite(s): Senior standing or permission

ENGR 4200 NUCLEAR REACTOR ENGINEERING (3 credits)
The physics governing nuclear reactors and the design principles for commercial nuclear power plants. Reactor designs currently operating in the power industry.

ENGR 4210 ELEMENTS OF NUCLEAR ENGINEERING (3 credits)
Survey of nuclear engineering concepts and applications. Nuclear reactions, radioactivity, radiation interaction with matter, reactor physics, risk and dose assessment, applications in medicine, industry, agriculture, and research. (Cross-listed with MECH 4210).
Prerequisite(s)/Corequisite(s): MATH 1970, PHYS 2120, and (ENGR 3010 or ENGR 3100)
ENGR 4500 ENGINEERING COOPERATIVE EDUCATION (0-12 credits)
Cooperative education work in a regularly established cooperative education work-study program in any engineering curriculum. Special approval is required to take course for credit hours. C/N only.
Prerequisite(s)/Corequisite(s): Senior standing; permission of College of Engineering Dean’s Office and department chair of student’s engineering major. All engineering students participating in cooperative education must register each term prior to commencing work.

ENGR 4600 PACKAGING ENGINEERING (3 credits)
Investigation of packaging processes, materials, equipment and design. Container design, material handling, storage, packing and environmental regulations, and material selection.
Prerequisite(s)/Corequisite(s): CONE 2060; MENG 3210 or MECH 3210; MENG 3730 or MECH 3730

ENGR 4610 RFID SYSTEMS IN THE SUPPLY CHAIN (3 credits)
Foundations of Radio Frequency Identification Systems (RFID). The fundamentals of how RFID components of tag, transponder, and antennae are utilized to create RFID systems. Best practices for implementation of RFID systems in common supply operations.

ENGR 4690 TECHNOLOGY, SCIENCE AND CIVILIZATION (3 credits)
(Lect 2 Dis. 2) This course studies the development of technology as a trigger of change upon humankind, from the earliest tools of Homo Habilis to the advent of the radio telescope in exploring the creation of the universe. The course traces the paths from early science to development of the sciences and technologies that will dominate the new millennium. (8696 is for non SET students) (Cross-listed with ENGR 8696).
Prerequisite(s)/Corequisite(s): Senior or permission.

ENGR 4810 SUPPLY CHAIN OPTIMIZATION (3 credits)
Foundations of supply chain network modeling. The concepts that support the economic and service trade-offs in supply chain and logistics management. Using decision support system (DSS) to design optimal logistics network models given data requirements and operational parameters. Using leading software packages to model problems arising in strategic management of logistics networks.

ENGR 4830 LOGISTICS IN THE SUPPLY CHAIN (3 credits)
The process of planning, implementing and controlling the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption. Domestic transportation systems, distribution centers and warehousing, international logistics, logistic system controls, and reengineering logistics systems.

ENGR 4900 GLOBAL EXPERIENCES IN ENGINEERING (1-3 credits)
Individual or group educational experience combining classroom lectures, discussions, and/or seminars with field and/or classroom studies in a foreign country. Choice of subject matter and coordination of on- and off-campus activities are at the discretion of the instructor.

ENGR 4910 SENIOR ENGINEERING SPECIAL TOPICS (1-3 credits)
Topics vary.

ENGR 8076 PROJECT MANAGEMENT (3 credits)
Project development, role of the project manager, project selection, project planning, budgeting and cost estimation, project scheduling, and project termination.

ENGR 8100 ERGONOMICS (3 credits)
Introduction to the principles of ergonomics. Information processing, human output and control, workplace design and environmental conditions. Not open to students with credit in ISMG 3150.

ENGR 8156 COGNITIVE ERGONOMICS (3 credits)
Human factors affecting work. Focus on humans: energy requirements, lighting, noise, monotony and fatigue, learning, simulations versus sequential tasks. Experimental evaluation of concepts.

ENGR 8166 PHYSICAL ERGONOMICS (3 credits)
Human performance in work. Human response to various environmental and task-related variables with emphasis on physical and physiological effects.
Prerequisite(s)/Corequisite(s): ENGR 4300 or permission

ENGR 8176 OCCUPATIONAL SAFETY HYGIENE ENGINEERING (3 credits)
Introduction to occupational hygiene engineering with emphasis on workplace environmental quality. Heat, illumination, noise, and ventilation.
Prerequisite(s)/Corequisite(s): Senior standing or permission.

ENGR 8230 RELIABILITY ENGINEERING (3 credits)

ENGR 8306 APPLIED STATISTICS AND QUALITY CONTROL (3 credits)
Systematic analysis of processes through the use of statistical analysis, methods, and procedures; statistical process control, sampling, regression, ANOVA, quality control, and design of experiments. Use of software for performing a statistical analysis.
Prerequisite(s)/Corequisite(s): MENG 3210 or MECH 3210.

ENGR 8310 STOCHASTIC PROCESSES (3 credits)

ENGR 8406 DISCRETE EVENT SIMULATION MODELING (3 credits)
Development of simulation models of discrete systems. Model development, Monte Carlo techniques, random number generators, and output analysis.
Prerequisite(s)/Corequisite(s): CONE 2060; MENG 3210 or MECH 3210 and CIST 1400 or CSCI 1620 or CSCI 2240 or permission

ENGR 8606 PACKAGING ENGINEERING (3 credits)
Investigation of packaging processes, materials, equipment and design. Container design, material handling, storage, packing and environmental regulations, and material selection.
Prerequisite(s)/Corequisite(s): CONE 2060, MENG 3210, MENG 3730

ENGR 8616 RFID SYSTEMS IN THE SUPPLY CHAIN (3 credits)
Foundations of Radio Frequency Identification Systems (RFID). The fundamentals of how RFID components of tag, transponder, and antennae are utilized to create RFID systems. Best practices for implementation of RFID systems in common supply operations.

ENGR 8696 TECHNOLOGY, SCIENCE AND CIVILIZATION (3 credits)
(Lect 2 Dis. 2) This course studies the development of technology as a trigger of change upon humankind, from the earliest tools of Homo Habilis to the advent of the radio telescope in exploring the creation of the universe. The course traces the paths from early science to development of the sciences and technologies that will dominate the new millennium. (8696 is for non SET students.) (Cross-listed with ENGR 4690).
Prerequisite(s)/Corequisite(s): Senior or permission. (ENGR 8696 is for non-SET students.)

ENGR 8816 SUPPLY CHAIN OPTIMIZATION (3 credits)
Foundations of supply chain network modeling. The concepts that support the economic and service trade-offs in supply chain and logistics management. Using decision support system (DSS) to design optimal logistics network models given data requirements and operational parameters. Using leading software packages to model problems arising in strategic management of logistics networks.

ENGR 8820 MATERIAL PLAN IN LOGISTIC SYSTEMS (3 credits)
Theory, practice and application of inventory, demand and supply planning techniques in multistage environments. Managing economies of scale, uncertainties, capacity constraints, and product availability in a supply chain. Integrated planning, supply chain coordination and technology enablers.
Prerequisite(s)/Corequisite(s): MENG 3210 or MECH 3210; ISMG 3280
ENGR 8836 LOGISTICS IN THE SUPPLY CHAIN (3 credits)
The process of planning, implementing and controlling the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption. Domestic transportation systems, distribution centers and warehousing, international logistics, logistic system controls, and reengineering logistics systems.

ENGR 8910 SPECIAL TOPICS IN ENGINEERING MANAGEMENT (1-6 credits)
Subject matter in emerging areas of engineering management and closely related areas not covered in other courses within the MEM curriculum. Topics, activities, and delivery methods vary.

ENGR 9010 TOTAL QUALITY MANAGEMENT USING SIX SIGMA TECHNIQUES (3 credits)
Introduction to advanced topics in Engineering Management and the foundations of Total Quality Management (TQM). Costs of quality, statistical tools, initiating change, advanced topics, and TQM in practice. Using DMAIC, DFSS, and CQPQ along with the other industry accepted Six Sigma Quality Techniques.

ENGR 9050 ANALYSIS OF ENGINEERING MANAGEMENT (3 credits)
Continuation of concepts and principles of engineering management applied to production cases.

ENGR 9060 FINANCIAL ENGINEERING (3 credits)
Applications of principle and financial economics in industrial and systems engineering. Term structure of interest, capital asset pricing and other capital allocation modes. Evaluation of real-options using binomial lattice, Black Scholes and other pricing models.
Prerequisite(s)/Corequisite(s): ISMG 8066.

ENGR 9190 DETERMINANTS OF OCCUPATIONAL PERFORMANCE (3 credits)
Focus on the individual in the industrial working environment. Emphasis on evaluation of fatigue, training, shift work, perception, vigilance, and work rest scheduling as they relate to the working environment.
Prerequisite(s)/Corequisite(s): Permission.