Engineering, Design, and Society

Degrees

- Master of Science in Humanitarian Engineering and Science (Thesis and Non-Thesis options)
- Graduate Certificate in Humanitarian Engineering and Science

Program Description

The mission of the Division of Engineering, Design, and Society (EDS) is to engage in research, education, and outreach that inspires and empowers engineers and applied scientists to become innovative and impactful leaders in sociotechnical problem definition, solution, and design who can address the challenges of attaining a sustainable global society.

The MS degrees in Humanitarian Engineering and Science (HES) are a Professional MS (non-thesis) and a thesis-based MS. These degrees are targeted to recent graduates or mid-career professionals with a BS in science and engineering who are interested in careers, research opportunities and/or acquiring skills that will help them work effectively in both HES and non-HES contexts. The degrees will include a core HES curriculum plus an approved stream of related courses in a traditional science or engineering discipline.

Master of Science (Non-thesis)

To obtain the minimum 30 credits for the non-thesis option, students must satisfy the following program requirements: (1) 12 credits of required HES courses; (2) 3 credits of approved elective classes; and (3) minimum 15 credits of classes approved by the affiliated department.

HES courses (15 credits):

- EDNS577 ADVANCED ENGINEERING AND SUSTAINABLE COMMUNITY DEVELOPMENT 3.0
- EDNS479 ENGINEERS ENGAGING COMMUNITIES 3.0
- EDNS590 RISKS IN HUMANITARIAN ENGINEERING AND SCIENCE 3.0
- EDNS580 HUMANITARIAN ENGINEERING AND SCIENCE CAPSTONE PRACTICUM 3.0
- ELECTIVES 3 credit hours of approved electives from list 3.0

Approved electives list: (partial list):

- EDNS430 CORPORATE SOCIAL RESPONSIBILITY 3.0
- EDNS475 ENGINEERING CULTURES IN THE DEVELOPING WORLD 3.0
- EDNS478 ENGINEERING AND SOCIAL JUSTICE 3.0
- EDNS480 ANTHROPOLOGY OF DEVELOPMENT 3.0
- HASS425 INTERCULTURAL COMMUNICATION 3.0
- HASS525 ENVIRONMENTAL COMMUNICATION 3.0
- HASS565 SCIENCE, TECHNOLOGY, AND SOCIETY 3.0
- MNGN482 MINE MANAGEMENT 3.0
- MNGN503 MINING TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT 3.0
- MNGN510 FUNDAMENTALS OF MINING AND MINERAL RESOURCE DEVELOPMENT 3.0
- MNGN565 MINE RISK MANAGEMENT 3.0
- MNGN567 SUSTAINABLE DEVELOPMENT AND EARTH RESOURCES 3.0
- MNGN571 ENERGY, NATURAL RESOURCES, AND SOCIETY 3.0
- PEGN530 ENVIRONMENTAL LAW AND SUSTAINABILITY 3.0
- CEEEN401 LIFE CYCLE ASSESSMENT 3.0
- CEEEN472 ONSITE WATER RECLAMATION AND REUSE 3.0
- CEEEN477 SUSTAINABLE ENGINEERING DESIGN 3.0
- CEEEN479 AIR POLLUTION 3.0
- CEEEN475/575 SITE REMEDIATION ENGINEERING 3.0
- CEEEN556 MINING AND THE ENVIRONMENT 3.0
- CEEEN570 WATER AND WASTEWATER TREATMENT 3.0
- CEEEN573 RECLAMATION OF DISTURBED LANDS 3.0
- CEEEN576 POLLUTION PREVENTION: FUNDAMENTALS AND PRACTICE 3.0
- CEEEN580 CHEMICAL FATE AND TRANSPORT IN THE ENVIRONMENT 3.0
- CEEEN581 WATERSHED SYSTEMS MODELING 3.0
- CEEEN592 ENVIRONMENTAL LAW 3.0
- GPGN577 HUMANITARIAN GEOPHYSICS 3.0
- GPGN533 GEOPHYSICAL DATA INTEGRATION & GEOSTATISTICS 3.0
- GPGN570 APPLICATIONS OF SATELLITE REMOTE SENSING 3.0
- GPGN574 ADVANCED HYDROGEOPHYSICS 3.0

Approved electives list:

- GPGN509 PHYSICAL AND CHEMICAL PROPERTIES AND PROCESSES IN ROCK, SOILS, AND FLUIDS 3.0
- GPGN511 ADVANCED GRAVITY AND MAGNETIC METHODS 4.0
- GPGN520 ELECTRICAL AND ELECTROMAGNETIC EXPLORATION 3.0
- GPGN530 APPLIED GEOPHYSICS 3.0
- GPGN555 EARTHQUAKE SEISMOLOGY 3.0
- GPGN561 SEISMIC DATA PROCESSING 3.0
- GPGN605 INVERSION THEORY 3.0

Other GPGN 500- or 600-level courses as approved by the GNGN program coordinator

Master of Science (Thesis)

To obtain the minimum 30 credits for the thesis option, students must satisfy the following program requirements: (1) 12 credits of required HES courses; (2) a minimum of 12 credits of approved affiliated department classes, and (3) 6 credits of MS thesis research on a thesis topic approved by the HES Director and affiliated department to make a total of 18 credits as illustrated below.

HES courses (12 credits in addition to the 6 credit hour thesis):
EDNS577 ADVANCED ENGINEERING AND SUSTAINABLE COMMUNITY DEVELOPMENT 3.0
EDNS479 ENGINEERS ENGAGING COMMUNITIES 3.0
EDNS590 RISKS IN HUMANITARIAN ENGINEERING AND SCIENCE 3.0
ELECTIVES 3 credits of approved electives from list 3.0

Affiliated Department Courses

Stream 1: Geophysics (GPGN) courses and thesis: 18 credit hours from:

GPGN577 HUMANITARIAN GEOPHYSICS 3.0
GPGN533 GEOPHYSICAL DATA INTEGRATION & GEOSTATISTICS 3.0
GPGN570 APPLICATIONS OF SATELLITE REMOTE SENSING 3.0
GPGN574 ADVANCED HYDROGEOPHYSICS 3.0
GPGN707 GRADUATE THESIS / DISSERTATION RESEARCH CREDIT 6.0

Mines’ Combined Undergraduate / Graduate Degree Program

Students enrolled in Mines’ combined undergraduate/graduate program (meaning uninterrupted registration from the time the student earns a Mines undergraduate degree to the time the student begins a Mines graduate degree) may double count up to six hours of credits which were used in fulfilling the requirements of their undergraduate degree at Mines, towards their graduate program. Any courses that count towards the graduate degree requirements as either “Required Coursework” or “Elective Coursework”, as defined below, may be used for the purposes of double counting at the discretion of the advisor (MS Non-Thesis) or thesis committee (MS Thesis or Ph.D.). These courses must have been passed with a “B-” or better and meet all other University, Department, Division, and Program requirements for graduate credit.

Graduate Certificate

This option is for graduate students who are interested in HES-related topics yet do not have the inclination to complete a full MS degree program. To obtain a graduate certificate, students must complete the following twelve (12) credits:

HES courses (12 credits):

EDNS577 ADVANCED ENGINEERING AND SUSTAINABLE COMMUNITY DEVELOPMENT 3.0
EDNS479 ENGINEERS ENGAGING COMMUNITIES 3.0
EDNS590 RISKS IN HUMANITARIAN ENGINEERING AND SCIENCE 3.0
ELECTIVES 3 credits of approved electives from list 3.0

Courses

EDNS577. ADVANCED ENGINEERING AND SUSTAINABLE COMMUNITY DEVELOPMENT. 3.0 Semester Hrs.
Equivalent with LAIS577.
Analyses the relationship between engineering and sustainable community development (SCD) from historical, political, ethical, cultural, and practical perspectives. Students will study and analyze different dimensions of sustainability, development, and “helping”, and the role that engineering might play in each. Will include critical explorations of strengths and limitations of dominant methods in engineering problem solving, design and research for working in SCD. Through case-studies, students will analyze and evaluate projects in SCD and develop criteria for their evaluation. 3 hours lecture and discussion; 3 semester hours.

EDNS580. HUMANITARIAN ENGINEERING AND SCIENCE CAPSTONE PRACTICUM. 3.0 Semester Hrs.
(I, II, S) This course allows students to practice the concepts, theories and methods learned in HES courses with the goal of making relevant their academic training to real world problems. This practicum can be achieved through a number of possibilities approved by HES director, including supervision and/or shadowing in HES-related activities, engaging in a social enterprise where they do problem definition, impact gap analysis and layout a business canvas, and designing and carrying out a project or fieldwork of their own, etc. Prerequisite: EDNS570, EDNS479. 3 hours research; 3 semester hours.

EDNS590. RISKS IN HUMANITARIAN ENGINEERING AND SCIENCE. 3.0 Semester Hrs.
(I) This course provides students with opportunities learn about risk and ways of analyzing engineering and scientific projects in relation to risks, and to develop multiple mitigation steps. The students will learn tools to develop their own designs while also evaluating associated risks along multiple dimensions and searching out synergies. 3 hours lecture; 3 semester hours.

EDNS598. SPECIAL TOPICS IN ENGINEERING DESIGN & SOCIETY. 6.0 Semester Hrs.
(I, II, S) Pilot course or special topics course. Topics chosen from special interests of instructor(s) and student(s). Usually the course is offered only once, but no more than twice for the same course content. Prerequisite: none. Variable credit: 0 to 6 credit hours. Repeatable for credit under different titles.

EDNS599. INDEPENDENT STUDY. 0.5-6 Semester Hr.
(I, II, S) Individual research or special problem projects supervised by a faculty member, also, when a student and instructor agree on a subject matter, content, and credit hours. Prerequisite: ?Independent Study? form must be completed and submitted to the Registrar. Variable credit: 0.5 to 6 credit hours. Repeatable for credit under different topics/experience and maximums vary by department. Contact the Department for credit limits toward the degree.