

# **BSE Chemical Engineering / MS Environmental and Water Resource Engineering (EWRE) SGUS Program**

## **Introduction/Summary**

This sequential graduate/undergraduate study (SGUS) program provides outstanding students in chemical engineering with an interest in environmental engineering the opportunity to receive an MSE degree in Environmental and Water Resources Engineering as part of an uninterrupted five-year program. Such students are allowed to “double-count” 9 credit hours. Each degree is awarded upon completion of the corresponding requirements.

## **Background**

There are several reasons students pursue an Environmental Engineering MSE degree in the EWRE program. Some students use it as a first step toward the Environmental Engineering Ph.D. degree. Other students pursue the master's degree to build their knowledge base in order to enhance their qualifications for professional environmental engineering careers. The Master's degree is generally considered to be the first professional level degree for a practicing environmental engineer. Most students select the masters-level courses in order to specialize in one or two of the following areas:

- surface/groundwater hydrology and contaminant transport
- water quality and water pollution control
- water, wastewater, and hazardous waste treatment
- physical, chemical, and biological treatment processes
- environmental soil physics, chemistry, and microbiology
- water resources policy and risk/benefit analysis

## **Admission procedure**

Students will normally apply for provisional admission to ChE/EWRE SGUS program in the second term of their junior year, after having completed 80 or more credit hours with a cumulative GPA of at least 3.5. To obtain provisional enrollment, a student must meet the SGUS program requirements and submit a written request to the CEE Graduate Committee. Students who do not meet the GPA requirement may petition the CEE Graduate Committee for a waiver of this requirement by providing other credentials, such as letters of recommendation from faculty or other evidence of special accomplishment. Once an SGUS student is within 6 credit hours of completing the required undergraduate degree, he/she must officially enroll in the EWRE MSE program for a minimum of two full terms, normally the last two semesters, and pay full graduate tuition for these two terms.

## **Program Description**

ChE / EWRE SGUS students must complete all the requirements for the BSEChE degree. In fulfillment of the technical and some free electives, SGUS students must elect courses that are approved for EWRE graduate credit. The double counted courses, typically CEE 428 (or CEE 526), CEE 460, and CEE 582, will be counted toward fulfilling both the BSE and MSE degree requirements.

It is expected that a student will have breadth in the fundamentals of environmental engineering. The following list of courses must be completed to meet this requirement:

CEE 460 – Design of Environmental Engineering Systems

CEE 581 – Aquatic Chemistry

CEE 582 – Environmental Microbiology

CEE 428 – Introduction to Groundwater Hydrology *or* CEE 526 – Design of Hydraulic Systems

CEE 587 - Water Resource Policy *or* NRE 562 – Resource Policy and Administration *or* NRE 571 – Environmental Economics

### **Requirements for the MSE Environmental Engineering**

#### *1. Credit Hours and Normal Progress*

A minimum of 30 credit hours of approved graduate work must be completed for the M.S.E. degrees. Nine to twelve hours of credit per term is the usual full-time graduate course load. Graduate students with research or teaching appointments generally elect no more than six to nine credit hours per term.

#### *2. Grades*

The average grade for all graduate level courses taken while enrolled in the Graduate School and for the 30 credit hours used to fulfill the credit hour requirement must be at least B (5.0/8.0). A grade below C in any course is unacceptable. A course in which a lower grade than C is obtained is not counted toward the credit hour requirement but is considered in the computation of the overall grade point average.

#### *3. Thesis*

A thesis is not required, but up to 6 hours of credit of directed study can be used toward the 30 degree credit hour requirement by electing Special Problems or Research courses in hydraulics/hydrology (CEE 622 or 921) or environmental engineering (CEE 682 or 980).

#### *4. Language*

Proficiency in the English language, both spoken and written, is expected. There is no requirement for proficiency in any other language.

#### *5. Comprehensive Examination*

Comprehensive examinations are required only for those students who wish to study beyond the M.S.E. degree.

#### *6. Residence Requirements*

The Graduate School residence requirements are satisfied by full-time students enrolled for 2 or more semesters. Students pursuing the M.S.E. degree on a part-time basis should become familiar with special requirements relating to part-time enrollment (see the BULLETIN).

#### *7. Transfer Credits (Not double counted credits)*

The Horace H. Rackham School of Graduate Studies guidelines permit transfer of up to six credit hours required for the M.S.E. degree from inter-university and intra-university sources combined according to the following rules:

##### *a. Graduate Credit*

A maximum of 6 hours of graduate credit may be transferred from another institution. These must be approved graduate-level courses taken while enrolled in a degree program with a grade of B or better from a graduate school of an accredited institution approved by the Horace H. Rackham School of Graduate Studies. Graduate extension courses will be considered only from The University of Michigan, Wayne State University, Michigan State University, Western Michigan University, Central Michigan University, Eastern Michigan University, Northern Michigan University and Oakland University. Considerations of credit transfer

will be made only upon written application of the student to the Graduate School through the Department of Civil and Environmental Engineering, and only after the student has established an overall graduate grade point average of B or better in resident work. Courses cannot be transferred for credit if already applied toward another degree, or if taken more than five years before beginning graduate study at The University of Michigan.

b. Pre-graduate Credit

Credit for courses taken by the student with a B grade or better earned during the senior year in The University of Michigan's College of Engineering may be included in the student's graduate study program subject to the following regulations: (1) credit was not used to meet the bachelor's degree requirement, either as required coursework or as required credit hours, (2) credit was earned no more than two years before formal admission to the Graduate School and (3) credit was earned in courses approved for graduate credit by the Graduate School. The student may request the transfer of such credits by the Graduate School through the Department of Civil and Environmental Engineering any time after admission.

**Study Program**

A minimum of 15 hours of the total 30 hours required for the M.S.E. degree must be elected from courses offered by the Department of Civil and Environmental Engineering. Graduate level courses taken to fulfill the breadth requirements described above may be counted towards this fifteen hour requirement. In addition to the courses required to fulfill the breadth requirements, a student must complete at least three other environmental and water resources engineering related electives (9 credit hours) in the department. Up to six credits of directed study (CEE 622, 682, 921, 980) may be taken to meet this requirement. It is expected that the selection of the elective courses will provide the student with more in-depth knowledge of a particular area within environmental engineering.

The 30 hours of graduate work must include at least two cognate courses (work related to the field of specialization) from a department other than Civil and Environmental Engineering. Courses cross-listed with the Department of Civil and Environmental Engineering cannot be accepted as cognate courses. Each cognate course must be a minimum of two credit hours. One cognate course may be used to satisfy the advanced mathematics requirement described in the following paragraph. The graduate courses from the School of Natural Resources and the Environment (NRE 562 and 571) required to fulfill the breadth requirement may also be used as one of the cognate courses.

The student must complete at least one course in mathematics, probability, statistics, or mathematical programming that is taught at a level consistent with a pre-requisite of Math 215. A list of both unacceptable and acceptable courses to meet this requirement has been developed and is available from the graduate program advisor. These lists are not exhaustive and if there are any questions regarding the acceptability of a particular course, including courses transferred from other institutions, the graduate program advisor should be consulted for approval.

A 400 level course that is listed in the BULLETIN of the Horace H. Rackham School of Graduate Studies may be elected for graduate credit when approved by the student's advisor. Of all the 400-level courses elected, no more than a total of 12 hours, and no more than 9 hours of 400-level Civil and Environmental Engineering courses, will be accepted towards the 30 hour requirement.

**Example focus areas of study in Environmental Engineering – Select three courses from among the listed courses (More fundamental courses are generally listed first)**

*Physicochemical and Biological processes*

CEE 580 – Physicochemical Processes in Environmental Engineering  
 CEE 592 – Biological Processes in Environmental Engineering  
 CEE 583 – Surfaces and Interfaces in Aquatic Systems  
 CEE 692 – Biological and Chemical Degradation of Pollutants  
 CEE 693 – Environmental Molecular Biology

*Environmental Decision Analysis*

CEE 570 – Introduction to Geostatistics  
 CEE 589 – Risk and Benefit Analysis in Environmental Engineering  
 CEE 587- Water Resource Policy  
 CEE 586 – Industrial Ecology

*Environmental Sustainability*

CEE 586 – Industrial Ecology  
 CEE 686 – Case Studies in Environmental Sustainability  
 CEE 580 – Physicochemical Processes in Environmental Engineering  
 CEE 589 – Risk and Benefit Analysis in Environmental Engineering

*Porous Media Processes*

CEE 528 – Flow and Transport in Porous Media  
 CEE 593 – Environmental Soil Physics  
 CEE 628 – Numerical Modeling of Subsurface Flow  
 CEE 583 – Surfaces and Interfaces in Aquatic Systems  
 CEE 594 – Environmental Soil Chemistry

*Environmental Fluid Mechanics*

CEE 521 – Flow in Open Channels  
 CEE 590 – Stream, Lake and Estuary Analysis  
 CEE 524 – Environmental Turbulence  
 CEE 523 – Computational Fluid Dynamics I  
 CEE 525 – Turbulent Mixing in Buoyant Flows  
 CEE 527 – Coastal Hydraulics

**Summary of requirements for 30 credits for the MSE EWRE degree – See page 3 for details**

CEE 582, Environmental Microbiology (satisfies BSE ChE biology/life science elective)  
 CEE 428, Introduction to Groundwater Hydrology, or CEE 526, Design of Hydraulic Systems  
 CEE 426, Design of Environmental Engineering Systems  
 CEE 581, Aquatic Chemistry  
 CEE 587, Water Resource Policy, or NSE 562, Resource Policy and Administration, or NRE 571,  
 Environmental Economics

Three additional Environmental Engineering electives

Two cognate courses

Students in this SGUS program are not eligible for an Environmental Engineering concentration in BSEChE.

## **CONTACTS**

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