

**The University Senate of Michigan Technological
University
Proposal 9-24**

“Minor in Water Resource Recovery Technology”

(Voting Units: Academic Only)

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1 . Primary Contact Information:

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2. Program/Degree Type: Minor

3. Program Title: Minor in Water Resource Recovery Technology

4. Planned Implementation Date: Fall 2024

5. Program Location/Modality:

All courses required for this minor are taught on campus, or are available on-line. The internship, which is described further below, will be conducted on site at a water resource recovery facility (WRRF) in Michigan, or possibly Wisconsin.

6. Target Student Population:

The target student population for this minor is students in the Michigan Tech BS in Environmental Engineering Program.

7 . General Description and Characteristics of the Program:

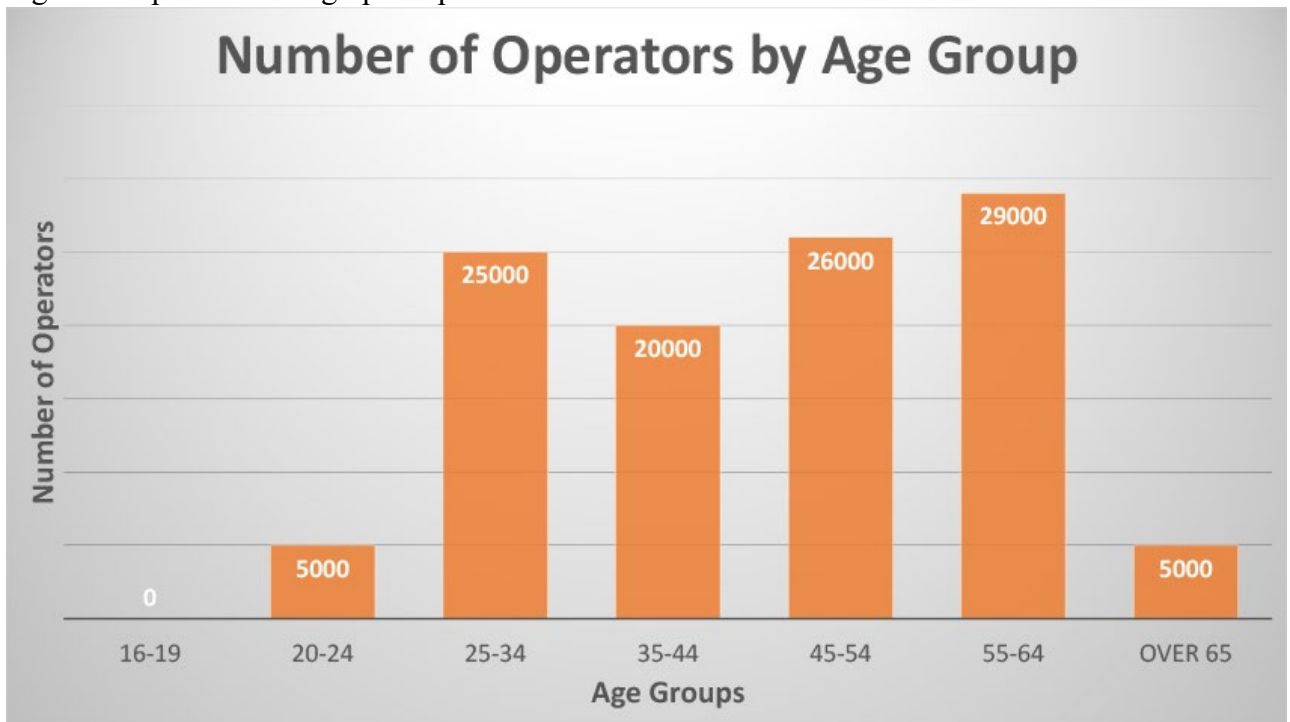
Goal: This minor will offer students in the Michigan Tech BS in Environmental Engineering Program, the background to eventually work in a WRRF at a management level. Specifically, they will meet the educational requirements required for Michigan’s Municipal Wastewater Treatment Plant Operator Class A Certification immediately after graduation, and will meet the experience requirements for Class D Certification.

8 . Rationale

According to Earl Wuestnick (Michigan Department of Environment, Great Lakes, and Energy (EGLE), Wastewater Operator Certification Program, personal communication), Michigan is facing a severe shortage of wastewater treatment plant personnel. This is true nationwide as retirements have resulted in a shortage of experienced water and wastewater treatment plant operators (<https://www.westech-inc.com/blog/shrinking-pool-water-and-wastewater-plant->

[operators-impacts-stability](#)). This problem is only going to become more serious over the next decade. Based on a Time magazine analysis of occupation-based retirement ages, only 0.91 percent of water and wastewater treatment plant operators work beyond 66 years of age, and recent U.S. Bureau of Labor Statistics data (Figure 1) show that more than 1/3 of current operations professionals are at, or nearing, retirement age. Based on current data, it is anticipated that the field will have lost about 4,550 experienced workers by 2021, and 27,550 by 2031.

Figure 1. Operator demographics per the U.S. Bureau of Labor Statistics 2019 estimate.



In recognition of this situation, the EPA announced America’s Water Sector Workforce Initiative (https://www.epa.gov/sites/default/files/2020-11/documents/americas_water_sector_workforce_initiative_final.pdf) to “support workforce resiliency for water utilities and thereby help ensure that Americans can continue relying on safe drinking water and vital wastewater services that protect public health and the environment.” To help with this situation in the state of Michigan, we are collaborating with EGLE to develop a program for producing graduates ready to enter the wastewater treatment workforce. In Michigan, Municipal Wastewater Treatment Plant Operators must pass a written exam for each level of certification, of which there are four: Class A, Class B, Class C, and Class D. Each level of certification has its own requirements for education and experience. Class A is the level of certification required for working in a supervisory role at a WRRF, which is the level at which most ENVE students ultimately will want to work. Students completing this minor will have met the educational requirements for Class A Certification.

They will not have the experience required to take the Class A exam, but they will have the experience to take and pass the Class D Certification exam and enter the work force as a Municipal Wastewater Treatment Plant Operator. The additional experience required to move to Class C, B, and A Certification will be obtained on the job after they enter the workforce. Class Certification with a four-year college degree requires 4 years of experience.

Although focused on those interested in wastewater treatment operations and administration, this minor will also be beneficial to students interested in careers in wastewater treatment plant design and wastewater equipment manufacture and sales.

An informal in-class survey taken in CEE 4502, Wastewater Treatment Principles and Design, during the Fall 2022 semester indicated that approximately 50% of the 50 students in the class were interested in the proposed minor.

9. Related Programs:

To our knowledge, there is not a comparable 4-year program in the State of Michigan, although there is a related two-year program in Water Resources Management at Bay College in Escanaba, MI, (<https://www.baycollege.edu/academics/programs/water-resource-management.php>), and an Associate in Applied Science Degree in water environment technology at Delta College in University Center, MI, (<https://www.delta.edu/programs/current/sciences-and-engineering/natural-science/water-environmental-technology/associate/index.html>).

10. Projected Enrollment:

It is difficult to judge the projected numbers of this program. It is anticipated that it would be <25 students, and more likely ≤ 5 students at a time. This program does not require additional faculty as it depends entirely on existing coursework, other than the internship.

11. Specialized Accreditation Requirements:

There are no specialized, or programmatic accreditors that would cover the program, per se. However, this program of study has been presented to, and approved by, the EGLE Board of Certification for Municipal Wastewater on Thursday, October 6, 2022.

12. Professional Licensure:

Wastewater treatment plant operator is not a licensed occupational profession in Michigan. However, as described above, in Michigan, Municipal Wastewater Treatment Plant Operators must be certified, and the goal of this program is to prepare students for certification in Michigan.

13. Learning Outcome:

Apply the principles of wastewater treatment and collection to design, operations, and/or administration of a class D or higher facility.

14. Assessment Plan:

Municipal wastewater treatment plant operator certification in Michigan requires applicants to meet requirements for education and experience. As discussed further below, one way the education requirements for Class A Certification in Michigan can be met is with a four-year college degree. The course work for that degree must include at least 9 semester hour credits in each of the three specified educational categories: Science, Engineering, and Administrative. Assessment of this coursework is accomplished via the ABET assessment performed by the Department of Civil, Environmental, and Geospatial Engineering (CEGE) for the BS in Environmental Engineering (ENVE) degree. In addition, the education component will also be assessed by tracking whether students successfully took and passed the written examination for Class D operator certification. The experience requirement for Class D Certification in Michigan can be met gaining acceptable operation experience in one or more of the specified areas of operations (preliminary/primary treatment, secondary/advanced treatment, residuals processing and disposal, laboratory analysis/industrial pretreatment, maintenance) in a Class D or higher treatment facility. This requirement will be assessed based on written feedback from their supervisor during their internship at a WRRF.

15. Curriculum Design

I. Total Credit Requirements: 19 credits

II. Catalog Description:

A minor in water resource recovery technology prepares students for employment with a city or municipality as a Municipal Wastewater Treatment Plant Operator. Specifically, they will have met the educational requirements for Class A operator certification in Michigan, which is required to work in a supervisory role, and will have met the experience requirements for Class D operator certification, which will allow them to enter the workforce. Students will gain valuable industry-specific skills required to successfully work at a water resource recovery facility (WRRF), including obtaining a working knowledge of the planning, design, building, and management of a WRRF's vital facilities.

III. List of courses to include course numbers, titles, credits and prerequisites:

Individuals seeking Class A Certification in Michigan with a four-year college degree must complete course work, including at least 9 semester hour credits in each of the three specified educational categories: Science, Engineering, and Administrative. The Science and Engineering credit requirements, are met by the BS in ENVE degree, plus this minor, with the Administrative courses mostly covered by the minor (see Table 1). These credits must be divided between at least 3 courses in different subject areas within each of the three general categories.

Note that work experience is also required for the minor in addition to the coursework, and is covered by the student taking UN 3002 (1 credit). Specifically, for UN 3002, students will intern at a WRRF in Michigan during their independent study. EGLE personnel, with assistance from the Michigan Water Environment Association (MWEA) and Michigan Rural Water Association (MRWA), will help arrange the internships. In addition, personnel from the Wisconsin Department of Natural Resources (DNR) wastewater program have indicated that they would be willing to assist in placing students in internships at WRRF in Wisconsin. EGLE has indicated that the students need to obtain at least 320 h of experience during their internship(s) (e.g., 8 weeks x 40 h/week = 320 h).

Table 1. Coursework for the Minor in Water Resource Recovery Technology:

Required – 7 credits	Number of credits	Educational category	Prerequisite
CEE 4502 Wastewater Treatment Principles and Design	3	Engineering	CEE 3501 or CEE 3503
CEE 4507 Water Distribution and Wastewater Collection Design	3	Engineering	(CEE 3501 or CEE 3503) and CEE 3620
UN 3002 Undergraduate Cooperative Ed. I	1	Experience	None
Selected technical electives – take 6 credits			
CEE 1003 AutoCad	1	Engineering	ENG 1002 or ENG 1100 or ENG 1101
CEE 4640 Stormwater Management & LID 1	3	Engineering	CEE 3620
CS 1121 Intro. to Programming I	3	Engineering	MA 1031(C) or MA 1032(C) or MA 1120(C)
CS 1122 Intro. to Programming II	3	Engineering	CS 1121
FW 3540 Introduction to GIS for Natural Resource Management	3	Engineering	MA 2710(C) or MA 2720(C) or MA 3710(C) or ENVE 3502 or CEE 3502(C)
SU 2000 Introduction To Surveying	2	Engineering	None
Choose at least 6 credits from the following courses			
EC 3400 Economic Decision Analysis	3	Admin.	UN 1015 and (UN 1025 or Modern Language - 3000 level or higher
ACC 2000 Accounting Principles	3	Admin.	None
CEE 3332 Fund. Of Construction Engineering	3	Admin.	None
CMG 4210 Construction Project Management	4	Admin.	CMG 4200 or CEE 3332
ENG 4300/OSM 4300 Project Management	3	Admin.	BUS 2100 or CEE 3710 or MA 2720 or MA 3710 or EE 3180 or BE 2110 or MA 2710
HU 3120 Technical and Professional Communication	3	Admin.	UN 1015 and (UN 1025 or Modern Language - 3000 level or higher
SS 2300 Environment and Society	3	Admin.	None
SS 2610 Introduction To Law and Society	3	Admin.	None
SS 2620 Introduction To Public Policy	3	Admin.	None

SS 3621 Public Policy & Public Management	3	Admin.	UN 1015 and (UN 1025 or Modern Language - 3000 level or higher)
SS 3630 Environmental Policy and Politics	3	Admin.	None
Total Requirements	19		

1 Only available on-line during summer.

16. New Course Descriptions

No new courses are being proposed for this minor.

17. Model Schedule:

An example schedule is illustrated below; however, there are many ways in which students could accomplish the required coursework.

Year 3			Year 4		
Fall	Spring	Summer	Fall	Spring	Summer
	CEE 4507	UN 3002	EC 3400	FW 3540	
		CEE 4640	CEE 4502	HU 3120	

18. Statement on Faculty Qualifications:

The primary faculty involved with the minor are Profs. Eric A. Seagren and Jennifer G. Becker whose qualifications can be found at the following URLs:

<https://www.mtu.edu/cege/people/faculty-staff/faculty/seagren/>

<https://www.mtu.edu/cege/people/faculty-staff/faculty/becker/>

19. Program-Specific Policies, Regulations, and Rules:

Not Required.

20. Library and Other Learning Resources Required:

All courses included in the minor are already available at Michigan Tech. Therefore, no additional library or other learning resources are required beyond what is already used for the courses included in the minor.

21. Suitability of Existing Space, Facilities, and Equipment:

Again, all courses included in the minor are already available at Michigan Tech. The space and facilities in CECE were recently reviewed (Fall 2023) during our ABET assessment, and deemed acceptable.

22. Program Costs:

At this time, the only estimated costs, or resources needed are personnel's time. Julie Ross is the academic advisor for the CECE Department. Her time may be needed in promoting and answering questions about the minor when the primary faculty members cannot be reached. The primary faculty members' time will also be needed in promoting and recruiting students to participate in the minor, and reaching out to EGLE to arrange for internships. As noted above, EGLE personnel, with assistance from the Michigan Water Environment Association (MWEA) and Michigan Rural Water Association (MRWA), will help arrange the internships. Whether or not the students are paid during their internships will depend on the finances of the specific utility where they perform their internship.

23. Criteria for Financial Evaluation Proposed Academic Programs:

Not Required.