UNIVERSITY OF MICHIGAN
College of Engineering
Curriculum Committee Meeting
Tuesday, December 10, 2024

Attending: Varun Agrawal, Achilleas Anastasopoulos, Yavuz Bozer, Xudong Fan, Chris Fidkowski, Anouck Girard, Saadet Albayrak Guralp, Elizabeth Holm, Amir Kamil, Leena Lalwani, Ryan Latimer, Xiaogan Liang, Frank Marsik, Carol Menassa, Radoslaw Michalowski, Nolgi Oquendo-Colon, Yulin Pan, Eric Rutherford, Elyse Vigiletti, Won Sik Yang

Support Staff: Mercedes Carmona, Matthew Faunce

Call to Order: 1:35 PM

Adjourned: 2:18 PM

Agenda:

1. Approval of 11.26.2024 Meeting Minutes – Page 2 - **APPROVED**
2. BSE in AEROSP Program Modification – Action Item – Page 5 - **APPROVED**
    a. The Aerospace Engineering department are making changes to the BSE curriculum of removing AEROSP 405, 4 credits as a required Aerospace Engineering Subject and increasing the Technical Electives from 9 to 13 credits. The department found that AEROSP 405 was an excessive laboratory requirement and adding the credits to technical electives allows students more course selection freedom. Also, a constant decline in students registering for AEROSP 405 over the past few years. Overall, the BSE credit total will still stay the same at 128 credits with changes implemented for Fall 2025 with current students choosing to graduate under the current or new requirements and admitted Fall 2025 students will graduate under the new requirement.
    b. CEE asks if AEROSP 405 is still to be offered and is not being deleted by the department.
        i. AEROSP confirms that the course will still be offered, but in the future the course may only be offered for Fall or Winter, but not both terms. Discussions to be continued by the AEROSP department.
    c. MECHENG department is concerned with the removal of the course due to the dual degree program with AEROSP and the course replacement AEROSP 405 has for MECHENG 495. Does this concern dual degree students? What about other AEROSP and MECHENG course replacements between programs?
        i. AEROSP will honor course replacements with MECHENG courses for dual degree students. There will not be any issues as the credits are staying the same for the degree requirement. AEROSP 405 being removed and moving credits to technical electives will give students other options to take courses and still satisfy degree requirements. The department will discuss overlapping courses with dual degree programs.
    d. IOE questions if there are an ABET implications due to this program modification.
        i. AEROSP states there are no implications as the ABET coordinator for the department did the mapping for the program and the modification for the program satisfies the requirements and more for the program.
    e. CoE CC members voted to approve this proposal. The proposal will appear at the next CoE Faculty meeting for Winter 2025.
3. CEE MEng in CEM Program Modification – Action Item – Page 8 – **APPROVED**
    a. The CEE MEng in CEM degree is moving from residential to online to be more accessible for students and hopes of gaining more students, international audience. There is no change in degree requirements between the residential and online program with the degree still requiring 26 credits between 2 semesters, there is an option for part-time students as well. There are several competitive institutions listed, University of Illinois at Urbana-Champaign, Purdue Polytechnic, Iowa State, and Lawrence Technology, that also contain Master's programs in construction engineering online, suggesting that there is a market opportunity for a new online program from the University of Michigan – College of Engineering. Data is included in the proposal that supports the increased preference for graduate online education, which gives students flexibility with jobs and families as well as using the Certificate in CEM with

stackable credits towards the MEng CEM degree reducing degree costs. Faculty will not teach more than 2 courses for the curriculum and deliver the courses above and beyond their regular teaching load. This change to be an online degree is to be implemented in Fall 2026. Once the program begins, there will be one admission cycle per year and then a move to two or three intakes a year in the future.

b. IOE suggests adding information regarding the Certificate in CEM that states that each course is worth 1 credit each, so 6 credits overall for the 6 courses taken.
c. CoE CC members voted to approve this proposal. The proposal will appear at the next CoE Faculty meeting for Winter 2025.

UNIVERSITY OF MICHIGAN
College of Engineering
Curriculum Committee Meeting
Tuesday, November 26, 2024

Attending: Achilleas Anastasopoulos, Yavuz Bozer, Xudong Fan, Chris Fidkowski, Anouck Girard, Saadet Albayrak Guralp, Elizabeth Holm, Amir Kamil, Leena Lalwani, Megan Langille, Ryan Latimer, Xiaogan Liang, Frank Marsik, Radoslaw Michalowski, Nolgi Oquendo-Colon, Yulin Pan, Kevin Pipe, Eric Rutherford, Elyse Vigiletti, Won Sik Yang

Support Staff: Mercedes Carmona, Betsy Dodge, Matthew Faunce

Call to Order: 1:34 PM

Adjourned: 2:27 PM

Agenda:

1. Approval of 10.15.2024 Meeting Minutes – Page 3 - APPROVED
2. New Dual Degree Program with Ross School of Business – Informational Item
    a. This new dual degree program with CoE and Ross will allow UM to be competitive against other universities, leverage the preeminence of Ross, CoE and UM at large, as well as developing an exceptional learning experience for students in Business and Engineering in meeting the demand to learn this skill set.
    b. CoE is the largest dual degree program involved with Ross representing 75-80 active dual degree students, half of these are dual with Computer Science, followed by Data Science and IOE. Average duration for dual degree is 8.6 terms with 50% of students finishing in 8 terms, but students need a lot of credits at least 170+. In a Fall 2023 Survey, students are willing to take Spring/Summer courses to graduate in 4 years.
    c. The Design Principles for this program include 8 semesters + one semester sequence for a total of 150 credits for BBA and CS Degree, currently both degrees require 170 credits. There will be an admissions process in both units/schools and seek curricular efficiencies while upholding core requirements. Equitable access to all participants, such as a student coming in with no AP Credits versus another student coming in with 33 AP credits and/or other transfer credit. All other engineering degrees must fit into the adjustments made to the BBA for the CS Degree.
        i. Curriculum Adjustments for the BBA are as follows:
            1. Combine Humanities and Social Sciences into one category, include ECON 101 + ECON 102 towards requirement.
                a. Required 11 hours of combine category and aligns better with CoE Requirements.
            2. Increase to 21 shared credits as currently only 15 of the 62 business credits can be shared/overlapped with another major.
            3. Accept 4.0 credits of specific course in each CoE Major that combine business topics toward business credits.
                a. Example for CS Major would be EECS 485. Moves Ross towards majority of other majors on campus.
            4. Develop a shared Capstone experience.
            5. All CoE Degrees to have ENGR 100 meet the First Year Writing Requirements for Ross. Also, cross-listed Capstone requirement.
            6. Specific degrees will need to make adjustments to fit the proposal.
                a. Example of CS Core filled by Ross Core, such as TCHNCLCM 300 met with BCOM 250 and BCOM 350 or EECS 496 met with a combination of ACCS 301, BL 300, MO 300 and STRATEGY 390 concepts. 10 credits of Flexible Technical Electives can be fulfilled with a select list of Ross courses.

d. There will be dedicated advisors for students, a faculty director, and co-curricular activities, such as Spring Break Tech/Business treks, Alumni mentoring, program interactions with industry leaders, and cohort gatherings. Large donor support and engineering alumni are very excited and supportive of this new dual degree.
e. The proposed governance structure is that any changes to the BBA Degree are subject to the Ross Faculty Approval. The Faculty Direction will rotate between Ross and Engineering for 3-year terms and engineering will hold the position first to help broaden interest. Shared courses will be reviewed by the joint faculty committee with an equal number of members from Ross and CoE with a yearly rotation to break any tied vote.
f. The timeline to implement these new changes are Academic Year 25-26 will have applications open as a separate joint application. Fall 2026 will be when the first cohort starts.
g. CEE and IOE question past partnership with Ross not always being onboard with CoE and how that is different for this new dual degree program.
    i. Kevin states there is a new Ross Dean that is working closely with the new CoE Dean. There is recognition of past problems between Ross and CoE that with the new stronger partnership there is confidence that this will be a better future moving forward for both Ross and CoE.
h. IOE brings up issues of capacity as in the past students were not accommodated, tuition issues and how this looks for both Ross and CoE, and admissions for what school/unit is making the decision to admit students for this program.
    i. On the student's application, there will be a checkbox for the school/unit for the student. As mentioned in the slides, there will be an admissions process in both units/schools and seek curricular efficiencies while upholding core requirements. There is an agreement with Ross and CoE on cohort size and a priority for students to be enrolled in the courses needed for their degree requirements. Tuition is split 50/50 between Ross and CoE and a budget plan worked out for the dual degree as this was the first item discussed between both units/schools.
i. MATSCIE is concerned with double counting courses that need to be accommodated for each CoE department. For example, CS does not need to be ABET accredited, but other departments that need to be ABET accredited have significantly less flexibility with the courses offered. Small departments such as MATSCIE and NERS only offer courses once a year, so there is not a lot of schedule flexibility.
    i. Kevin says that IOE is ABET accredited and can accommodate students and courses currently with the dual degree program. Students may need to take another semester with departments that are ABET accredited, but there is a current advisor that is working with IOE and CS to establish schedules and is willing to work with any department that may need assistance with scheduling issues. Sample schedules would need to be developed for this dual degree program, which students can then reach out to an academic advisor to look at broadly at all requirements and figure out the best route for student scheduling. If any department wants the contact for this dedicated advisor, Kevin is happy to provide this to any department that may need it.

CARF SUMMARIES

PAGE	SUBJECT	COURSE #	ACTION	SUMMARY	EFFECTIVE TERM	MIN. GRADE REQ. FOR ENF. PREPREQ	Is Course on LSA Course Guide?	APPROVED	NOTES & REVISIONS	TABLED
5	CEE	850	NEW		FT 2025	NO	NO	CONDITIONAL APPROVAL	Department to review the Course Description and prerequisite (undergraduate vs graduate students for course). The CoE RO will follow up with Page 3 Contact Hours for the course.	
14	CEE	975	NEW		FT 2025	NO	NO	CONDITIONAL APPROVAL	Department to review the Course Description and Repeatability for number of repeatable credits, and prerequisites for graduate standing (undergraduate vs graduate students for course).	
17	CSE	592	MOD	Change to Credit Exclusions.	WT 2025	NO	YES	APPROVED		

AEROSPACE ENGINEERING
UNIVERSITY of MICHIGAN ■ COLLEGE of ENGINEERING

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November 27, 2024

To: College of Engineering Curriculum Committee
From: Krzysztof Fidkowski, Aerospace Engineering
Re: Aerospace Engineering Curriculum Revision

The Aerospace Engineering faculty have approved a change to the BSE curriculum, which we are forwarding for approval by the College of Engineering. The change consists of:

- The removal of AEROSP 405 (Aerospace Laboratory II, 4 credits) as a required course for the BSE.
- Increasing our BSE technical elective credit requirement from 9 to 13.

The goal of this change is to remove what was deemed by the faculty as an excessive laboratory requirement, and to allow more freedom in course selections through technical electives.

Our transition plan is to cease requiring AEROSP 405 in the Fall of 2025. Students entering the Aerospace Department in Fall 2025 will graduate under the new requirement. Students currently in the program will be able to choose to graduate under the old or new requirements.

Sample Schedule 2025-2026									
Aerospace Engineering	**Total**	**Term**							
	Credits	1	2	3	4	5	6	7	8
Subjects Required by all Programs (55 hours)									
Mathematics 115, 116, 215, and 216	16	4	4	4	4	-	-	-	-
ENGR 100, Introduction to Engineering	4	4							
ENGR 101, Introduction to Computers	4	-	4	-	-	-	-	-	-
CHEM 125/126, 130 or 210, 211[1]	5	5	-	-	-	-	-	-	-
Physics 140 with Lab 141[2]	5	-	5	-	-	-	-	-	-
Physics 240 with Lab 241[2]	5	-	-	5	-	-	-	-	-
Intelectual Breadth	16	3	3	2	-	-	-	4	4
Related Technical Core Subjects (12 hours)									
MECHENG 240, Intro to Dynamics and Vibrations	4	-	-	-	-	4	-	-	-
Engineering distribution 1[3]	4	-	-	-	-	4	-	-	-
Engineering distribution 2[3]	4	-	-	-	-	-	4	-	-
Aerospace Science Subjects (26 hours)									
AEROSP 201, Introduction to Aerospace Science	2	-	-	2	-	-	-	-	-
AEROSP 215, Introduction to Solid Mechanics and Aerospace Structures	3	-	-	-	3	-	-	-	-
AEROSP 225, Introduction to Gas Dynamics	3	-	-	-	3	-	-	-	-
AEROSP 315, Aircraft and Spacecraft Structures	3	-	-	-	-	-	3	-	-
AEROSP 325, Aerodynamics	3	-	-	-	-	3	-	-	-
AEROSP 335, Aircraft and Spacecraft Propulsion	3	-	-	-	-	-	3	-	-
AEROSP 341, Aircraft Dynamics (W) or AEROSP 343, Spacecraft Dynamics (F)	3	-	-	-	-	-	3	-	-
AEROSP 350, Introduction to Aerospace Computing	3	-	-	-	-	3	-	-	-
AEROSP 470, Control of Aerospace Vehicles	3	-	-	-	-	-	-	3	-
Aerospace Engineering Subjects (13 hours)									
AEROSP 200, Introduction to the Aerospace Enterprise	2	-	-	-	2	-	-	-	-
Design/Build/Test/Fly Course Requirement[5]	3	-	-	3	-	-	-	-	-
AEROSP 305, Aerospace Engineering Lab I	4	-	-	-	-	-	-	4	-
AEROSP 481, Aircraft Design (F) or AEROSP 483, Space System Design (W)	4	-	-	-	-	-	-	-	4
Electives (22 Hours)									
Technical Electives[4]	13	-	-	-	4	-	-	3	6

General Electives	9	-	-	-	-	2	3	2	2
Total	128	16	16	16	16	16	16	16	16
Candidates for the Bachelor of Science degree in Engineering (Aerospace Engineering) - B.S.E. (Aerospace E.) - must complete the program listed above. This sample schedule is an example of one leading to graduation in eight terms.									
Notes:									
1. If you have a satisfactory score or grade in Chemistry AP, A-Level, IB Exams or transfer credit from another institution for Chemistry 130/125/126 you will have met the Chemistry Core Requirement for the College of Engineering									
2. If you have a satisfactory score or grade in Physics AP, A-Level, IB Exams or transfer credit from another institution for Physics 140/141 and 240/241 you will have met the Physics Core Requirement for the College of Engineering									
3. Engineering distribution requirement. Select two courses from: MSE 220, MSE 350, EECS 215, EECS 216, EECS 280, EECS 281									
4. Technical electives must total at least 9 credits of approved upper division courses (that is, 300 level or above). At least 3 credits must be approved mathematics or science courses, a maximum of 3 credits is allowed for directed study and a maximum of 2 credits is allowed for seminar courses. Recommended courses that satisfy the mathematics or science technical electives are described in a document that can be obtained from the Department or on the Department website.									
5. DBTF Requirement. Can be met by any DBTF course recommended by the Aero undergrad advising office, including AEROSP 205 and 388. If the course is not in the Aero department, 3 extra credits of tech elective are required.									

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MEMO

To: Curriculum Committee, College of Engineering

From: Radoslaw L. Michalowski
Chair, CEE Curriculum Committee

Date: December 3, 2024

Subject: CEE Proposal for Online Delivery of the Existing Master of Engineering (M.Eng.) in Construction Engineering and Management (CEM)

The proposal specified in the subject line is made in an effort to make the M.Eng. degree in Construction Engineering and Management, offered by the CEE Department, more accessible to a wider audience, and attract an increased number of students to the program.

This proposal was presented to the CEE faculty, and was unanimously approved by the CEE Curriculum Committee and by the CEE Graduate Committee.

The timeline for implementation of this online degree-program is the fall term of 2026 (Section 14 of the proposal). The CEE Curriculum Committee did not identify any CARFs that would need to be modified in order to accommodate the new delivery mode.

It is expected that the CEE Tishman Construction Management Program will retire the residential M.Eng. in CEM once the online M.Eng. in CEM is fully launched.

Proposal for Online Delivery of the Existing Master of Engineering (M.Eng.) in Construction Engineering and Management (CEM)

Tishman Construction Management Program (TCMP)

Department of Civil and Environmental Engineering (CEE)

Michigan Engineering Online and Professional Education (ME-OPE)

The University of Michigan (U-M)

Table of Contents

1. Introduction

The Tishman Construction Management Program (TCMP), housed within the Department of Civil and Environmental Engineering (CEE) at the University of Michigan, offers a world-class and innovative education and research program in Construction Engineering and Management (CEM). The University of Michigan is a pioneer in construction education and research and launched the first graduate program in Construction Engineering and Management in 1954. The TCMP continues this tradition with strong emphasis on the highest level of professional practice and research.

This proposal consists of adding an online modality of delivery to the existing Master of Engineering (M.Eng.) in Construction Engineering and Management (CEM). The addition of the online modality expands the program's reach to a broader professional audience of learners who are geographically distributed within and beyond Ann Arbor, Michigan.

It is expected that TCMP will retire the residential M.Eng. in CEM once the online M.Eng. in CEM is fully launched.

CEE will partner with ME-OPE, the College of Engineering's home for online and professional education, to support the development, launch, and management of the online version of the CEM M.Eng. program.

2. What Related Programs Exist

Overview of Competitive Landscape: Table 1 summarizes the U.S. landscape of online master's degrees in construction engineering and management (CEM) assessed, noting their 2024 U.S. News civil engineering program rankings (residential) and their rankings for online graduate engineering programs. Additionally, learners may also be aware of or consider the M.S. in Construction Management at Michigan State University or the Master of Civil Engineering at Johns Hopkins University. The U-M College of Engineering has 5 existing M.Eng. online degrees that have an overall 2024 US News Online Engineering Grad Ranking of 8.

Table 1. Master's programs in construction engineering delivered online, included in landscape scan

Institution	**Program**	**Civil Eng. Ranking** (2024)	**US News Online Grad Engineering Ranking (Overall)** (2024)	**No. of Credits**
UIUC	M.S. in Civil Engineering	1	2	36
Purdue Polytechnic	M.S. in Construction Management	5 (Purdue)	3	33
Columbia	M.S. in Civil Engineering	19	8	30
NC State	Master of Civil Engineering (MCE)	31	19	30

U of Florida	M.S./M.Eng. in Civil Engineering	31	17	30
Iowa State	M.S./M.Eng. in Civil Engineering	31	-	30
U of Washington	M.S. in Civil Engineering: Construction Engineering	12	-	42
NJ Institute of Technology	M.S. in Civil Engineering: Construction Management	87	61	30
Lawrence Tech	Master of Construction Engineering Management	123	67	30

Peer Program Details: Analysis indicates that several competitors offer civil engineering degrees with a CEM specialization, and only a limited number of top-ranked civil engineering departments provide these degrees online. Presently, University of Illinois at Urbana-Champaign (UIUC) and Purdue appear to be the sole top 10 ranked institutions that offer such online programs. This suggests that there may be a market opportunity for a new online program from a top-ranked department. The proposed U-M program could fill this niche and differentiate itself through distinct features and offerings not currently available from these leading competitors, while closely aligning program tuition pricing to that of the competitors.

University of Illinois at Urbana-Champaign offers an online 36-credit M.S. in Civil Engineering without an advertised duration, priced at $36,000 for all students, regardless of residency. The program is ranked number one for online civil engineering studies and caters to Bachelor's degree holders in Civil Engineering seeking to improve their job prospects. Distinct to the program are multiple courses related to data analytics and optimization. Instruction is delivered by research-active faculty who maintain strong industry ties, offering students practical opportunities including site visits, internships, and research with real-world applications. Furthermore, the specialized Global Leaders in Construction Management track aligns with the needs of construction management professionals.

Purdue Polytechnic's 33-credit M.S. in Construction Management is a 24-month program targeted at professionals with an accredited bachelor’s degree in construction management, civil engineering, architecture, or a closely allied field, and who have at least two years of professional experience in construction management. The program is competitively priced at $22,000 for Indiana residents and $30,000 for non-residents, making it one of the more economical options among comparable offerings. The curriculum is designed to offer the benefits of an MBA with a focus on construction operations and management. Courses are taught by industry practitioners who bring a wealth of practical upper-level management experience, bridging academic theory with real-world application. Students in the program engage with industry projects and experts, applying learning outcomes directly to their careers in construction management.

3. Target Audience

The target audience for the proposed online M.Eng. in Construction Engineering and Management is domestic and international learners immersed in the construction industry, including individuals with a background in architecture and other related sectors participating in the architecture, engineering and construction (AEC) industry. Based on research by Wiley Education Services (Clinefelter et al., 2019), the potential target audience consists of recent

undergraduates and professionals returning to education, averaging 33.7 years old, often with full-time jobs and family responsibilities. Possible job titles of prospective students in this group may include: Cost Estimator, Construction Scheduler, Field Engineering, Assistant Project Manager, VDC (Virtual Design and Construction) Engineer, Project Engineer, Development Manager, etc. The online modality is designed to meet their needs for affordability, reputable programming, engagement with quality faculty, a quick path to graduation, and flexible course options. The online modality allows students to complete the M.Eng. degree at a distance while living outside of Ann Arbor, maintaining their employment while being geographically dispersed, and with a level of flexibility often required for working professionals and adult learners.

Additionally, learners who complete the U-M non-credit online Construction Engineering and Management Certificate (Certificate) program can stack the credential for credit upon admission to the M.Eng. degree. Currently, learners who successfully complete the Certificate, and are then admitted to the M.Eng. program may have up to 6 credits waived in the degree program. The Certificate also offers a path for cost savings in total tuition of the M.Eng. degree as learners who complete the Certificate only need to complete 20 additional course credits to obtain the 26 credit M.Eng. degree. Having the online modality for the M.Eng. degree provides existing online Certificate learners with a continuous and low barrier pathway to complete the degree program if admitted. Many of the learners who complete the Certificate are in entry level positions in construction such as Site Engineers or are students who recently completed or are pursuing an undergraduate degree in Civil and Environmental Engineering or Construction Engineering and Management. A Master's degree is desirable for additional career mobility into higher level roles in the industry.

The Academic department and Program leadership are exploring discussions with industry-related companies to facilitate a pipeline of possible students into the online degree. As noted based on the residential M.Eng. program, most major construction companies provide an annual tuition allowance for their employees to pursue master's degrees or other continuing education.

The Program Directors are exploring the possibility of making the program eligible for Sequential Undergraduate/Graduate Studies (SUGS) applicants, which would expand the pipeline of learners to current University of Michigan undergraduates who wish to pursue their master's degree immediately after their undergraduate work.

Admissions Requirements: Applicants for the M.Eng. in CEM degree will have completed (or will be nearing completion of) a 4-year undergraduate degree in Civil Engineering or related fields from an ABET accredited institution or other recognized national or international university/institution of higher education.

This program also welcomes applications from students with non-Civil Engineering education backgrounds. Applicants with backgrounds in other engineering fields may be admitted but may be required to take a course in Civil Engineering Materials (e.g., CEE351) before a M.Eng. degree can be awarded, if they have not had prior coursework in civil engineering materials.

Applicants with Bachelor's degrees in Architecture or other 4+ year non-engineering programs may be admitted to our graduate program if they have completed adequate coursework in college-level mathematics (e.g., MATH215 - Multivariable Calculus, MATH 216 - Differential Equations, CEE 373 - Probability and Statistical Methods) and physics (e.g., PHY140 – Mechanics, PHY240 - Electricity and Magnetism) and if they have at least a B average in these mathematics and physics courses. Such applicants may be admitted but may be required to

take courses in Civil Engineering Materials (e.g., CEE351), and at least one other subject from among Structural Engineering (e.g., CEE312) or Geotechnical Engineering (Soil Mechanics) (e.g., CEE345) before a Master's degree can be awarded, if they have not had prior coursework in these subjects.

Short descriptions of the contents of the University of Michigan courses that are identified above as potentially required are available through the provided links. Additional information about engineering programs and courses at the University of Michigan is available through the College of Engineering Bulletin.

Each applicant will be considered based on their individual academic preparedness, experiences, and merit, and any recommendations for supplemental engineering courses (e.g., CEE312, CEE345 or CEE351) that need to be completed before a M.Eng. degree can be awarded will be made at the time of admission to the M.Eng. in CEM program. An admitted student can enroll and complete any such identified civil engineering courses concurrent with the coursework required for the M.Eng. Degree.

Upon matriculation, students should work with their academic advisors to ensure that they have taken all classes to satisfy the degree requirements. Students can take required supplemental courses at other institutions upon approval of their equivalency with courses offered at U-M by the program directors.

Application material for the online M.Eng. in Construction Engineering and Management consist of the following:

- Completed online application form
- Application fee (a check or money order made payable to University of Michigan or completed credit card information)
- Statement of Purpose and Personal Statement
- Three Letters of Recommendation.
- Transcripts (Marksheets) from all colleges and universities attended
- International Students only: Test of English as a Foreign Language (TOEFL), International English Language Testing Systems (IELTS), or Michigan English Language Assessment Battery (MELAB) scores

  * GRE Scores are not required.

4. Rationale

Serving a New Audience: The proposed online Master of Engineering in Construction Engineering and Management (CEM) program responds to market needs. Research by Capranos et al. (2021) indicates a strong preference among graduate students for online education, with approximately 80% considering alternative online programs if their preferred choice is not available. These students typically value the flexibility to balance education with full-time employment and personal commitments. Data show that while many graduate students reside within commuting distance of a university, a significant number are willing to look beyond their local region for online programs that align with their professional goals. Furthermore, a Wiley Education Services survey (Clinefelter et al., 2019) describes the average online graduate student as 33.7 years old, often with family responsibilities, and employed either full or part-

time. The online M.Eng. in CEM aims to cater to these needs by providing a practical, accessible educational option for a diverse, geographically dispersed, and professionally engaged student population.

Creating a Stackable Pathway: While the online Certificate in Construction Engineering and Management (formerly CEM MasterTrack Certificate) program consistently sees 60-70 online completions annually, it has not translated into significant matriculation into the residential M.Eng. in CEM program. Offering an online M.Eng. degree presents an accessible and cost-effective pathway for learners to transition their certificate credits toward this advanced degree without the added expense associated with a residential format. With infrastructure investments driving industry growth and a clear preference among graduate students for online learning, the potential for successful program adoption is significant. The online M.Eng. in CEM program stands to capitalize on these trends by providing a program that meets both market and student demands.

Growing Industry and Demand for CEM Professionals: Projected job growth in construction management and related fields underscores the timeliness of the proposed online M.Eng. program. The Bureau of Labor Statistics forecasts a modest increase of 2-8% in the employment of construction managers, architecture and engineering managers, and civil engineers from 2021 to 2031, nationally. Specifically for Michigan, the growth is expected to be more robust at 8-12% over the same period. As the industry evolves, about one-third of these jobs will require a master's degree, thus this program will supply qualified professionals to meet this higher education benchmark. For construction managers, the anticipated growth is particularly notable at 8% nationwide and 9% in Michigan. The data suggests that the job market for roles in the construction engineering and management sector is expanding, and the proposed program would prepare graduates for these opportunities (Data source: BLS and O*NET).

5. Curriculum Design

The M.Eng. in Construction Engineering and Management degree is a 26 credit program which requires at least 18 hours of graduate courses in CEM, 6 hours of graduate courses in a Secondary area, and 2 hours of graduate seminars in CEM. The program emphasizes construction professional practice and a term-long construction professional practice project is part of the curriculum. A thesis or other major research project is not required.

The Program Directors will work with ME-OPE to establish key program standards. Program standards establish consistency across program processes and plans to ensure a cohesive experience for prospective, admitted, and matriculated students, and provide guideposts for faculty teaching and administering the program.

Program faculty will work with the ME-OPE instructional design and media production teams to develop asynchronous online courses to be delivered based on best practices, quality measures, and regular and substantive interaction to serve the online students. This will consist of use of Canvas as the Learning Management System (LMS) where students can access their courses after two-factor authentication with Duo, where learning materials and course interactions are centralized in one platform which meets accessibility standards and IT functions that are supported by ME-OPE, the College of Engineering, and the University of Michigan.

Courses will be designed for a faculty to student ratio consistent with best practices for online graduate-level students. Ideally, courses will be capped at about 30-40 students per section in order to maintain quality interactions between faculty and students as well as among students. Building community among students early in the program will support and foster teamwork in courses.

Plans for Regular and Substantive Interaction (RSI) and faculty initiated engagement between program faculty and students will be mapped out at the beginning of the course development process. Demonstration of RSI includes, but is not limited to, having predictable and scheduled interactions initiated by the program faculty with students such as weekly office hours along with formative and summative assessments of learnings including assignments, discussions, and exams. Students will receive feedback and engagement by the faculty consistently throughout the course.

The online M.Eng. in CEM curriculum details are shown below:

Core Curriculum: 15 Credits

- CEE 530 - Construction Professional Practice (3 credits)
- CEE 531 - Construction Cost Engineering (3 credits)
- CEE 532 - Advanced Construction Management (3 credits)
- CEE 536 - Project Planning Scheduling and Control (3 credits)
- CEE 435 - Building Information Modeling (3 credits)

Graduate Seminars: 2 Credits

- CEE 830 - Const Grad Seminar (1 credit) [must be taken twice over two terms]

Construction Elective: 3 Credits

Students may select from the list of courses below:

- CEE 534 - Construction Engineering, Equipment, and Methods (3 credits)
- CEE 537 - Construction of Buildings (3 credits)
- CEE 539 - Modern Construction Management (3 credits)
- CEE 555 - Sustainability of Civil Infrastructure Systems (3 credits)

Secondary Electives: 6 Credits

- Students may select courses from the Construction Elective section above and other pre-approved courses in relevant disciplines. Examples include:
    - CEE 565/ESENG 501 - Seminars on Energy Sys, Tech, and Policy (3 credits)
    - CEE 567/ESENG 567 - Energy Infrastructure Systems (3 credits)
- Learners who successfully complete the online Certificate in Construction Engineering and Management, and receive admission into the M.Eng. program, may have up to 6 credits of the Secondary Electives requirement waived, and will only need 20 credits of coursework beyond the certificate to obtain the M.Eng. in CEM degree.

6. Description of Courses

- CEE 435 - Building Info Modeling (3 credits)
    - Fundamentals of Building Information Modeling (BIM) methods and their significance in project management and collaboration; Application of BIM in primary construction management functions such as coordination, design clash

detection, sequencing, safety, logistics, and communication; BIM-based Integrated Project Delivery (IPD) approach and the project lifecycle; Reality capture methods for as-built documentation in BIM; BIM in facility and asset management; BIM standards and interoperability. (Kamat)

- CEE 530 - Construction Professional Practice (3 credits)
    - Industry speakers, team projects. Teams work with contractor or owner/client addressing industry problems as volunteer consultants, prepare/present written and oral reports to class and client. (Menassa)

- CEE 531 - Construction Cost Engineering (3 credits)
    - Cost engineering for construction organizations, projects and operations. Break-even and profit analyses. Equipment cost and procurement decisions. Construction financial accounting, cost accounting, cost control systems. Cost indices, parametric estimates, unit price proposals. Projects are overseen and graded by faculty and may also involve mentoring by representatives from external organizations. (Kamat)

- CEE 532 - Advanced Construction Management (3 credits)
    - The course covers the fundamentals of project-based organization, project delivery systems, resource management focusing primarily on human aspects, organizational behavior and culture, change and interface management, productivity measurement and analysis, and construction safety and ergonomics. Examples and case studies from construction are used to help students' learning. (Lee)

- CEE 534 - Construction Engineering, Equipment, and Methods (3 credits)
    - Engineering principles of earthmoving equipment; Mobile and tower cranes; Concrete production, transportation, and placement; Formwork and reinforcement systems; Aggregate production; Concrete and steel bridge construction; Asphalt and concrete paving; Piled foundations. Projects are overseen and graded by faculty and may also involve mentoring by representatives from external organizations. (Kamat)

- CEE 536 - Project Planning Scheduling and Control (3 credits)
    - Project planning and scheduling with arrow and precedence networks using the Critical Path Method (CPM). Advanced scheduling using overlapping networks. Project control, C/SCSC and earned-value systems. Scheduling under uncertainty, PERT, PNET, and Monte-Carlo simulation. Time-cost tradeoff, resource allocation, and resource leveling. Scheduling using the Repetitive Scheduling Method (RSM). (Ioannou)

- CEE 537 - Construction of Buildings (3 credits)
    - Material selection, construction details, manufacture, fabrication and erection of building structures using steel, light wood, timber, cast-in-place concrete, precast concrete and masonry; and materials for roof, floor and wall surfaces. Zoning, building codes and other legal issues. Introduction to HVAC and electrical systems. Field trips to construction sites. (Kelly)

- CEE 539 - Modern Construction Management (3 credits)
    - As technological integration and construction complexity increase along with construction lead time and budget constraints, staying competitive in the construction industry is challenging. Construction Companies seek to shorten the duration of construction project completion and to remain within the budget by managing construction development efforts effectively. This can be achieved by understanding and applying modern construction management methods. To this end, this course will discuss how to organize, evaluate, and manage a construction project. By the end of the term students will be able to understand and apply modern construction management to effectively manage a construction project in an Architecture/ Engineering/ Construction(A/E/C) organization. (Lee)

- CEE 555 - Sustainability of Civil Infrastructure Systems (3 credits)
    - Life Cycle Cost Analysis and Life Cycle Analysis – Methods and Applications in Civil Infrastructure Systems; Building Energy Modeling and Simulation; Energy Management in Buildings; Impact of Building Occupants and Behavioral Challenges; Renewable Energy and Efficiency in Buildings; Existing Buildings and Technical/Social Challenges of Energy Retrofits; and Building Certifications (e.g., LEED). (Menassa)

- CEE 565/ESENG 501 - Seminars on Energy Systems, Technology, and Policy (3 credits)
    - This course is intended to provide students with an understanding of the critical issues in energy technologies. Researchers, industry leaders, entrepreneurs and policymakers discuss technology, policy and economic drivers for sustainable global energy systems. Students complete homework assignments and a term paper on an energy-themed subject. (TBD)

- CEE 567/ESENG 567 - Energy Infrastructure Systems (3 credits)
    - Technologies and economics of electric power generation, transmission and distribution are discussed. Centralized versus distributed generation and fossil fuels versus renewable resources, are considered in regard to engineering, market and regulatory principles. Students develop an understanding of energy challenges confronting society and investigate technologies that seek to address future needs. (TBD)

- CEE 830 - Construction Graduate Seminar (1 credit)
    - Presentation of topics on construction engineering and management practice and research. This seminar will be offered twice per year. (Kelly)

7. Projected Enrollments

We expect that the new online M.Eng. in CEM will be attractive to a large number of learners in the various groups identified in the Target Audience section. In addition, based on the interactions with learners in the online CEM certificate, we expect that a significant number of learners in that program will apply to and matriculate into the online M.Eng. program. Based on these projected learner streams, we anticipate that we will enroll 20-25 online CEM M.Eng. students in the first cohort.

By creating an enhanced advertising and marketing program, we expect to increase the cohort size to 30-40 students per intake over the next 2-3 years. It is expected that growth to 40-50 students per intake may be achieved through strategic marketing and advertising to domestic and international student cohorts, and that this class size and quality of learning is sustainable with current faculty resources and adequate GSI/IA support. Expansion beyond 30-40 students per intake is also possible over time by scaling the appropriate instructional resources. Note that two separate cohorts after year one will overlap, essentially doubling the size of total SCH. In general, the size and type of each class will determine the level of instructional support (GSI/IA/Grader) provided to be consistent with best practices for online graduate-level courses.

8. Scheduling Plans

Students in the program may complete the degree on a full-time basis in two academic semesters (one academic year) or on a part-time basis over the course of multiple academic years. Students who wish to complete the degree on a part-time basis will work closely with their academic advisors to develop a pathway to degree completion that meets their needs and time constraints. Students who wish to be considered for part-time federal financial aid eligibility must enroll in at least 4 credits per semester. At the onset, there will be one admission cycle per year (Fall). It is expected that Program administration will move to two intakes per year after the pilot first launch of the online program, and possibly three intakes per year in the future depending on availability of appropriate instructional resources.

9. Tuition Rate and Revenue Share

We are proposing an inclusive distance learning tuition rate for the online CEM M.Eng. degree program that is competitive with our peer universities and is commensurate with the marketplace for a distinctive online program from Michigan Engineering. More specifically, we propose a tuition rate of $1,359 per credit x 26 credits ($35,334) for in-state learners and $1,505 per credit x 26 credits ($39,130) for out-of-state learners. These rates are commensurate with the current College of Engineering distance learning tuition rates, but are proposed as a flat rate per credit in lieu of the currently operating sliding scale.

After all program startup costs, recurring University assessments (including Provost tax and student fees), and recurring program delivery costs (including GSI/IA, ME-OPE expenses and faculty compensation) are recovered by the College (ME-OPE), net revenue will be split as follows: 70% of net revenue will be allocated to the Department of Civil Engineering and 30% of net revenue will be distributed to the College (RPM).

10. Faculty Effort and Compensation

This proposal recognizes that all the classes in the proposed online M.Eng. program are pedagogically equivalent to the classes in the residential M.Eng. program, and that the online classes are simply different sections of the residential classes offered in an alternate learning modality.
Faculty effort and compensation for developing and teaching online classes comprises two components: 1) Initial content development and periodic refreshes, and 2) Course delivery.

Initial Content Development: Initial content development involves the faculty effort and supporting resources for preparing the existing courses for online delivery in partnership

with ME-OPE. Such development of course materials will occur prior to their online delivery. Periodic refreshes of the course material will depend on the course content and will be performed as the need arises.

Delivery of the Online Sections of the Courses: The participating TCMP faculty members will deliver the online courses assigned to them above and beyond their regular CEE department residential teaching load as outlined in the CEE Department Course Offset Policy.

The faculty members will be compensated by ME-OPE for course development and course delivery, per an established MOU between the faculty members and ME-OPE.

11. Description of Available/Needed Equipment

The curriculum for the online version of the M.Eng. degree is modeled after the existing residential M.Eng. program with the majority of courses coming from CEE. Additional secondary elective courses may come from other departments across the College of Engineering, as well as potential electives from across the university, based on the student learning paths and advising from the program faculty directors. All courses will be designed for online delivery, and converted to an asynchronous online format by the faculty of record with instructional design and course production support services from ME-OPE.

The College of Engineering provides in-house expertise and resources via ME-OPE. CEE will assign Faculty Co-Directors and a Graduate Program Coordinator to manage the curricular, advising, admissions, degree planning, and student support functions, while collaborating with ME-OPE and other CoE/U-M departments for dependable course design and production, instructional team (faculty/GSI/IA) technology support, financial management, marketing and recruitment efforts, facilities, compliance and regulatory support, technical support on ME-OPE supported platforms, and other online program management functions.

The M.Eng. in Construction Engineering and Management program will use technology-enabled course production facilities, faculty support resources, and expertise provided by ME-OPE. A skilled team of ME-OPE program developers, instructional designers, and production media specialists support the College’s academic units and faculty from new program conceptualization to launch and beyond.

During the course design phase, ME-OPE will collaborate with and support faculty members to ensure this fully asynchronous online degree adheres to the highest quality standards and best practices for online course design and delivery. ME-OPE instructional designers will help faculty in a variety of ways, ranging from course design, setup and structure to the actual delivery and maintenance of course content.

ME-OPE will provide the resources and technical support to help faculty prepare for and convert their content and record lectures, tutorials, and supplemental content in ME-OPE’ dedicated production studios and classrooms. ME-OPE studios are equipped with state-of-the-art technology to enable the creation of quality online digital assets, and may be configured for a variety of purposes, including standard lecture capture (e.g., PowerPoint lecture), lightboard technology, course engagement, interviews and discussion, or lab demonstrations. Any recording requested at an off-site location, especially those outside of the ME-OPE studio such

as in a lab, will require advance notice and close communication with the ME-OPE Production team.

The online learning management system (LMS) will be powered by Canvas, the University's standard LMS. Online courses will be uploaded and maintained on Canvas by ME-OPE.
In collaboration with the CEE faculty, ME-OPE will support the evaluation of the course design prior to launch using the Quality Matters 7th edition rubric. On behalf of the College, ME-OPE will provide oversight for the initial and ongoing assessment, continuous improvement, and sustainability of the program.

12. Statement of Faculty Qualifications

Below are biographies of key program faculty members:

Photios G. Ioannou

- Photios G. Ioannou is Professor in CEE at the University of Michigan. He has earned a Ph.D. and a S.M. in Civil Engineering from MIT and is Dipl.Eng. in Civil Engineering from the National Technical University of Athens, Greece. His research has advanced and defined the state of the art in construction engineering and management technologies, principles, and practices particularly in the areas of tunneling, competitive bidding theory, project scheduling, decision support systems, innovative project delivery systems, and construction simulation.

Vineet R. Kamat

- Vineet R. Kamat is the John L. Tishman Family Professor in CEE and Director of Graduate Degree Programs in the College of Engineering at the University of Michigan. Professor Kamat received his Ph.D. and M.S. degrees in Civil Engineering from Virginia Polytechnic Institute and State University, and B.E. from Goa University. He specializes in the simulation and visualization of construction processes, automated construction, and the development of methods to improve safety and productivity in construction operations. His research often focuses on the application of advanced information technologies such as real-time 3D computer graphics, virtual and augmented reality, and autonomous construction equipment.

David Kelly

- David Kelly, Ph.D., P.E., F.ASCE is a Lecturer in civil and environmental engineering. Before coming to the University of Michigan, he was a Vice President at Turner Construction Company (Turner). Turner is a North America-based, international construction services company and is the leading general builder in the United States. Dr. Kelly worked for Turner over 25 years and held numerous positions including field engineer, assistant superintendent, scheduling engineer, assistant estimating engineer, project engineer, chief estimating engineer, preconstruction manager, business manager, and general manager. His project portfolio includes commercial office (low- and high-rise), data center, education, healthcare, historic renovation, industrial, pharmaceutical, public & assembly, research, and transit buildings. Dr. Kelly earned a Ph.D. in technology with concentration in construction management from Eastern Michigan University, a M.E.M. with concentration in systems engineering and project management from Northwestern University, and a B.S. in civil and environmental engineering from Lafayette College. He is a licensed professional engineer in Michigan

and Illinois, a fellow in the American Society of Civil Engineers (ASCE), and past president of the ASCE Michigan Section, Southeastern Branch.

SangHyun Lee

- SangHyun Lee is the Professor and John L. Tishman Faculty Scholar in CEE at the University of Michigan. He earned his Ph.D. and MSc degrees from MIT, and B.E. from Dong-A University in Korea. He leads the Dynamic Project Management (DPM) Group at the University of Michigan, which aims to understand and manage construction dynamics and human-infrastructure interface through sensing, data analytics and computer simulation. Particularly, DPM is interested in achieving the maximum benefit from technologies like wearables, automation and robotics for humans in construction and infrastructure. DPM also applies these technologies to direct smart and connected communities and cities toward social equality.

Carol C. Menassa

- Carol C. Menassa is the Professor and John L. Tishman Faculty Scholar and SICIS Lab Director in CEE at the University of Michigan. She earned her Ph.D. in Civil and Environmental Engineering and M.S. in Finance from the University of Illinois at Urbana-Champaign, and M.S. and B.S. in Civil and Environmental Engineering from American University in Beirut. Her research focuses on understanding and modeling the interconnections between the human and the built environment. Her research group has expertise in energy simulation, complex adaptive systems modeling, high-level architecture and informatics, computer vision and robotics.

13. Program Administration

The online M.Eng. in CEM will be housed in CEE and led by Faculty Program Co-Directors, Carol Menassa and Vineet Kamat. The Program Directors will oversee the program's curricular and academic elements including curriculum design and course offerings schedules, program admissions, academic advising, development and maintenance of program policies, student support, management of course instructors and support staff, and evaluation and assessment efforts. A Curriculum Committee will be appointed to assist the faculty directors with curricular and academic decisions. A Graduate Program Coordinator will also be assigned in CEE to manage daily operations and student interactions.

ME-OPE will be responsible for managing the program's non-academic, administrative related activities including assistance with program positioning and market research, program approval support and coordination, compliance with distance education federal and state regulations, fiduciary oversight, recruitment and marketing efforts, course instructional design and quality assurance, video production and editing, LMS management and support, specialized support for online students, and management of vendor/strategic partnerships.

Program administrators will work to engage prospective, admitted, and matriculated students from initial awareness of the program through graduation and beyond. The College of Engineering, CEE, and ME-OPE will bring awareness of the M.Eng. program to targeted audiences through a range of marketing and advertising initiatives including web presence, social media, newsletters, corporate relationships, and other channels. A Graduate Program Coordinator will be available to advise students, answer questions, track communications, and follow-up with prospective and current students. ME-OPE will also offer front-line communications support to answer basic questions and triage requests to the Department.

Program support will be offered to students similar to other College of Engineering online programs:

- The program leverages Canvas as the main learning management system (LMS) platform for all course delivery - this creates a consistent experience for students looking to access their course materials.
- Faculty teaching and GSIs/IAs supporting distance learning sections will be expected to hold virtual office hours, and respond to student inquiries via synchronous and asynchronous methods to provide students with support and timely communication
- Virtual discussion forums such as Piazza, where program faculty members and GSIs can efficiently manage class Q&A
- Academic advising, degree requirement counseling, and degree audits provided by the Program faculty team
- Admissions vetting will be coordinated by the Program Coordinator, and performed by Program instructors
- Students will receive regular updates/newsletters and invitation to events (virtual options possible) from the Department of Civil and Environmental Engineering
- Students will be notified of existing University resources and how to access relevant services such as the Consultation, Assistance, and Resources in Engineering (CARE) Center, career services, disability services, etc and in compliance with what allowable by university, state, health and other related policies
- Students will be provided access to all University Library resources and support

14. Planned Implementation Date

The planned Effective Term to begin offering the program to online students is Fall 2026.

15. Library and Other Learning Resources

Students will have full, remote access to the University of Michigan’s libraries and other resources. Though not a requirement of the program, if students are on-campus they will also have access to in-person resources as necessary. College of Engineering librarians are available through virtual consultation as well as synchronous or asynchronous virtual library instruction. As a result of the University’s transition to remote learning due to the COVID-19 pandemic, College of Engineering Librarians developed short learning modules (including topics such as Introduction to Standards, Searching Web of Science, and Advanced Literature Searching) in Canvas (the College’s and program’s Learning Management System), which can be imported into the program’s courses and assigned to students.

Students will have access to resources by the University, College of Engineering, and CEE that can be conducted online for remote and geographically distributed learners. This includes access to resources from the University libraries, Student Services with Disability (SSD) office, career services, CARE center support and the CAEN-remote lab services in accordance with U.S. export control regulations and U-M’s software license agreements.

16. Specialized Facilities, including External Sites as Required

No specialized facilities will be required as part of this program. Students will leverage existing University and College of Engineering software that are also made available to distance learning students. Any additional or unique program software needed will be done in collaboration with the program, CEE department, CAEN and Information Technology Services (ITS).

17. Academic Integrity

This program aligns with standards and practices of the Michigan Engineering Honor Code. Trust is the cornerstone of the Michigan Engineering Honor Code which has been in place for more than 100 years. Academic integrity is a fundamental responsibility of our students. In an online environment, one of the most important considerations for academic integrity is the design of course assessments. According to the Honor Code, the instructor is available for questions during examinations, but the examination is not considered proctored, as proctoring does not align with the Honor Code. Concerns may arise about academic integrity in an online environment among faculty and students alike.
Courses in all modalities, including online courses, align under the Michigan Engineering Honor Code, and are subject to the same high standards, reporting methods, consultations, investigations, and disciplinary actions. Recommendations and resources to ensure academic integrity are the culmination of extensive deliberations among the College of Engineering leadership and faculty and has been corroborated by the College's 25 years of experience with online teaching and learning.

Some ways in which academic integrity are considered in course design activities include educating students about the Honor Code and their responsibilities; requiring students to sign and acknowledge the Honor Code prior to every exam; establishing expectations for integrity, technology, and collaborations; motivating students to master the subject; fostering a culture of trust; making low and high stake design decisions; considering alternative strategies and assessments; and utilizing best practices and tools for online assessments, such as using a central LMS, automatic generation of questions, multiple versions of exams, question randomization, timed exams, incorporating hand-written responses, open-ended questions, and managing how graded assignments are returned to the students. Exam monitoring is also an option that has been used for distance courses if the faculty member chooses this approach, and the College of Engineering has experience operationalizing a robust process for this function if utilized.

Key strategies to mitigate honor code situations in online courses include managing expectations and addressing student questions in the beginning course about what is considered acceptable and unacceptable collaboration within the course, as these expectations can vary between assignments and courses. Faculty may choose to post those expectations in the syllabus, and/or with each assignment or project, and consider dedicating part of the deliverables' description with relevant information.

Either a student or a faculty member may report a suspected Honor Code violation by contacting the College's Honor Code Representative. Students accused of violating the Honor Code are encouraged to sign up for an Honor Code Consultation for personal

advising. During this advising counseling session, a student respondent is able to gather information and receive advice as to how to proceed with their Honor Code case.

The accusation is then investigated by the Engineering Honor Council, and if wrongdoing is found, a recommendation is sent to the Faculty Committee on Discipline (FCD). After a full investigation and, if an Honor Code violation has occurred, the online student is subject to appropriate sanctions and the same disciplinary actions as a residential student.

18. ADA and Other Regulatory Compliance

CEE will work with ME-OPE to ensure the program is compliant with federal and state distance education regulations.

Program Planning, Marketing & Recruitment: Marketing and recruitment materials will accurately represent all aspects of the program, thoroughly detailing program requirements, such as any in-person components, and the extent to which the program is online. Clear and comprehensive information on financial charges, tuition, any distance-related fees, as well as available financial aid and assistance, will be articulated. The materials will also provide realistic graduate employment prospects.

All partnerships with third-party providers, if any, will be established with compliance as a guiding principle, ensuring alignment with our quality and ethical standards. The program will explicitly address the needs of students based outside of Michigan and international students. We are committed to linking to Distance Education Disclosures on the program’s description and application pages, and we will integrate formal acknowledgment of this disclosure information into the application process itself.

Conditionally admitted students will be required to certify that they will not access course content or utilize University of Michigan's services from countries subject to U.S. sanctions. Proactive measures will be taken to verify whether additional permissions are necessary before recruiting from physical sites in other states. Furthermore, planning to enroll international students will involve early collaboration with the International Center to ensure all immigration regulations and institutional policies are strictly observed.

In terms of data handling and privacy, the program will maintain the highest standards by ensuring that appropriate data-handling practices are consistently followed. In the event of recording course activities, plans will be in place to create recordings that are in compliance with the Family Educational Rights and Privacy Act (FERPA), safeguarding students' privacy and educational records.

This program does not lead to or result in state licenses or certifications.

Course Design and Development: Courses will meet the requirements for student academic time investment, ensuring that there are 37.5 hours of student engagement per credit over a full 16-week term, based on current university standards and Federal Guidelines. Courses will incorporate methods to track and demonstrate student attendance, such as submission of assignments, lecture video viewership, and engagement on online discussion boards for every week of instruction. Regular and substantive interaction (RSI) opportunities, including personalized assignment feedback by the instructor and scheduled office hours, will be clearly listed in the course syllabus as well as in the course content. Additionally, the modalities of

interaction between students and instructors will be detailed and faculty will complete an interaction plan during development.

Active participation will be fostered through multiple avenues, whether it be via synchronous sessions or through asynchronous activities integrated into the course structure. Faculty will have strategies in place for monitoring student engagement and performance, allowing prompt identification and support of students requiring additional assistance. As much as possible, course components will be integrated into the Learning Management System (LMS), leveraging its secure logins and two-factor authentication to ensure a secure educational environment. Any additional technologies, including software, for course activities must be identified and evaluated in the early stages of course development. All additional software and tools must be clearly connected to course outcomes and objectives. Technologies not currently procured by the College or University are not guaranteed.

Students will be informed about academic integrity policies, with course materials underscoring their significance. Consultation with the Export Control Officer (ECO) will be undertaken to determine whether any course content may contravene export control regulations. A thorough review of all third-party materials will be conducted for copyright compliance. Finally, the design of the program will be inclusive, adhering to the Web Content Accessibility Guidelines (WCAG) 2.1 AA specifications to ensure digital accessibility and the University's Standard Practice Guide Policy 601.20 on Electronic and Information Accessibility. Moreover, courses will encourage equity and inclusivity by directing students to pertinent University- and school-level conduct policies and support resources within course onboarding materials and syllabi.

19. Accreditation Requirements

No accreditation is required for the Master of Engineering in Construction Engineering and Management degree.

The University of Michigan is accredited by the Higher Learning Commission of North Central Association of Colleges and Schools 30 North LaSalle Street, Suite 2400, Chicago, IL 60602-2504. Phone: 800-621-7440 or 312-263-0456.

20. Plans for Assessment and Communication of Assessment Results to ADGPE

Consistent with reporting requirements of residential M.Eng. programs, the Program Directors, with the assistance of ME-OPE, will be responsible for tracking relevant program performance metrics including enrollment statistics, student performance and learner feedback, job placement information, and other relevant data. These results will be shared with ADGPE on an annual basis as part of the annual review meeting.

21. Entities Responsible for Deletion of the Program if Circumstances Warrant

The Department of Civil and Environmental Engineering will work with ME-OPE and the Associate Dean for Graduate and Professional Education to ensure all approval requirements

are met if circumstances warrant deletion of the program. Per the College of Engineering Curriculum Committee's guidelines, the CEE Department Chair and Program Director(s) will secure and provide the following:

- Memo from the department or program chair or designee to the College Curriculum Committee requesting deletion of the degree program/certificate, including final date for the degree program/certificate, and plan to support current students through completion of the program
- Letter(s) of support for the deletion from other participating departments/programs
- Letter of support from the appropriate Associate Dean for Graduate Education for the deletion of the degree program/certificate
- Any CARFs associated with deletion of the degree program/certificate

ME-OPE administrators will notify affected University and College of Engineering partners, including Registrars, the Center for Academic Innovation/Vice Provost for Academic Innovation, Office of the Provost, and others. ME-OPE maintains a comprehensive sunsetting plan/checklist for deletion of online degree programs.

22. Letter of Support

CEE Dept Chair Letter

ADGPE

CoE Dean

COLLEGE OF ENGINEERING
CIVIL & ENVIRONMENTAL ENGINEERING
UNIVERSITY OF MICHIGAN
2350 Hayward ■ 2105 G.G. Brown ■ Ann Arbor Michigan 48109-2125
PH: 734-764-8495 ■ FAX: 734-764-4292 ■ yafeng@umich.edu

December 6, 2024

Dear colleagues:

On behalf of the Department of Civil and Environmental Engineering, I am pleased to submit this letter in support of the proposal for the Online Delivery of the Existing Master of Engineering (M.Eng.) in Construction Engineering and Management (CEM). The proposal has been developed by the Tishman Construction Management Program (TCMP) within the Department of Civil and Environmental Engineering in collaboration with Michigan Engineering – Online and Professional Education (ME-OPE).

The proposed online M.Eng. in CEM is targeted towards learners interested in careers (or to advance their careers) in the architecture, engineering, construction and facilities management field. It specifically caters to those who seek the flexibility of an online degree while benefiting from a program offered by a top-ranked department.

The online M.Eng. in CEM degree mirrors our existing residential M.Eng. in CEM in terms of program structure and courses. The degree is a 26-credit program which requires at least 18 hours of graduate courses in CEM, 6 hours of graduate courses in a related area as Secondary Electives, and 2 hours of graduate seminars in CEM. The curriculum emphasizes professional construction practice including courses in modern construction management, planning and scheduling, sustainable construction methods and a term-long professional practice project.
All courses in this program are currently offered to our residential students on a regular basis. These courses will have new sections for the online students. Learners who successfully complete the online Certificate in Construction Engineering and Management offered through ME-OPE and receive admission into the M.Eng. program, may have up to 6 credits of the Secondary Electives requirement waived, and will only need 20 credits of coursework beyond the certificate to obtain the M.Eng. in CEM degree.

The TCMP Faculty (SangHyun Lee, Photios Ioannou, David Kelly, Vineet Kamat and Carol Menassa) will deliver these courses in addition to their regular CEE department residential teaching responsibilities.

The planned Effective Term to begin offering the program to online students is Fall 2026. The attached proposal document outlines the main characteristics of this degree in detail.

Thank you for reviewing the proposal. Please feel free to reach out if you have any questions.

Sincerely,

Yafeng Yin, Ph.D.
Donald Cleveland Collegiate Professor of Engineering
Donald Malloure Department Chair of Civil and Environmental Engineering
University of Michigan, Ann Arbor

MICHIGAN ENGINEERING
UNIVERSITY OF MICHIGAN

Krista Rule Wigginton, Ph.D.
Associate Dean for Graduate & Professional Education
Professor of Civil and Environmental Engineering

December 4, 2024

Dear Colleagues,

On behalf of Michigan Engineering, I am pleased to provide this letter of support for a proposed online Master of Engineering (M.Eng.) in Construction Engineering and Management (CEM) program. This new online degree program will be offered through Michigan Engineering in collaboration with the Department of Civil and Environmental Engineering (CEE).

The M.Eng. in CEM will deliver a rigorous curriculum emphasizing Construction Project Management, Engineering and Technology Integration, and Sustainable Practices in Civil Engineering. Developed with the support of Michigan Engineering Online & Professional Education (ME-OPE), the College's dedicated hub for online and professional education, this program aligns with Michigan Engineering's strategic mission to advance excellence in graduate education and broaden its global reach and impact.

This 26-credit-hour program is designed to balance academic rigor with flexibility, making it particularly well-suited for working professionals. Delivered online, this program targets early to mid-career professionals who can more easily manage personal and professional responsibilities while completing their coursework. Additionally, this new degree program articulates with the College's existing Construction Engineering and Management (CEM) certificate program. Students completing the CEM certificate program will have the opportunity to transfer up to six credits toward the new M.Eng. degree, offering reduced cost for those students pursuing this pathway.

The Department of Civil and Environmental Engineering will oversee the administration and continuous assessment of this program to ensure academic quality and alignment with industry standards. My office will conduct an annual review of outcomes and impacts as part of the College's overarching oversight responsibilities. In the event that program discontinuation becomes necessary, CEE will manage the process to ensure continuity and minimize disruption for enrolled students.

This program represents a meaningful advancement in our College's commitment to innovation in education and industry engagement. We welcome any input you might have about this proposal.

Sincerely,

Krista Rule Wigginton, Ph.D.
Associate Dean for Graduate & Professional Education
Professor of Civil and Environmental Engine

Robert H. Lurie Engineering Center, 1221 Beal Avenue
Ann Arbor, Michigan 48109-2102 USA

MAIN: 734 647-6851
kwigg@umich.edu

Proposal for Online Delivery of the Existing Master of Engineering (M.Eng.) in Construction Engineering and Management (CEM)

Tishman Construction Management Program (TCMP)
Department of Civil and Environmental Engineering (CEE)
Michigan Engineering Online and Professional Education (ME-OPE)
The University of Michigan

December 2024

Proposal prepared by

Michigan Engineering Online and Professional Education (ME-OPE)

- Amanda Winters, Assistant Director of Online Degree Programs
- Shubha Kashyap, Director of Student Affairs and Faculty Relations
- Chris LaBelle, Executive Director for Online and Professional Education

Department of Civil and Environmental Engineering / Tishman Construction Management Program

- Carol Menassa, Professor and John L. Tishman Faculty Scholar
- Vineet Kamat, John L. Tishman Family Professor

Tishman Construction Management Program (TCMP): Residential Masters Degrees and Online Certificate

Residential

- Master of Science in Construction Engineering and Management - MSE in CEM (30 credits)
- Masters of Engineering in Construction Engineering and Management – M.Eng. in CEM (26 credits – designed to be completed in 2 semesters)
- Masters of Science in Civil and Environmental Engineering (Construction Engineering and Management Specialization)

Online

- Certificate in Construction Engineering and Management (6 courses, 1 credit each – stackable with the MEng in CEM)

Introduction

This proposal consists of adding an **online modality of delivery** to the existing Master of Engineering (M.Eng.) in Construction Engineering and Management (CEM) – Effective Term: Fall 2026

The addition of the online modality expands the program's reach to a broader professional audience of learners who are geographically distributed within and beyond Ann Arbor, Michigan

CEE will partner with ME-OPE, the College of Engineering's home for online and professional education, to support the development, launch, and management of the online version of the CEM M.Eng. program

Main Highlights of the Proposal

Not a new degree (Asynchronous delivery of residential CEM M.Eng.)

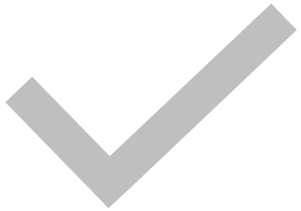
No new courses (Same courses with new sections for online delivery)

No new CARFS

No work at registrar

No approval required from MASU (Michigan Association of State Universities)

Required Approvals



Approvals in CEE:

Graduate Committee

Curriculum Committee

Faculty

Approval by COE Curriculum Committee

Approval by COE Faculty

U-M Provost and Vice Provost for Academic Innovation

UM Board of Regents (Tuition Rates)

Competitive Landscape Overview

Institution	Program	Residential Civil Eng. Graduate Ranking (2024)	US News Online Graduate Engineering Ranking (Overall) (2024)	No. of Credits
UIUC	M.S. in Civil Engineering	1	2	36
Purdue Polytechnic	M.S. in Construction Management	5 (Purdue)	3	33
Columbia	M.S. in Civil Engineering	19	8	30
NC State	Master of Civil Engineering (MCE)	31	19	30
U of Florida	M.S./M.Eng. in Civil Engineering	31	17	30
Iowa State	M.S./M.Eng. in Civil Engineering	31	-	30
U of Washington	M.S. in Civil Engineering: Construction Engineering	12	-	42
NJ Institute of Technology	M.S. in Civil Engineering: Construction Management	87	61	30
Lawrence Tech	Master of Construction Engineering Management	123	67	30

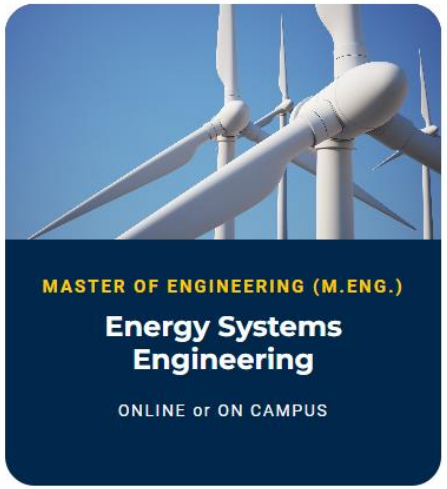
ME-OPE: Online Graduate Degrees

2024 US News Online Engineering Graduate Ranking: 8

MASTER OF ENGINEERING (M.ENG.)

Automotive Engineering

ONLINE or ON CAMPUS



MASTER OF ENGINEERING (M.ENG.)

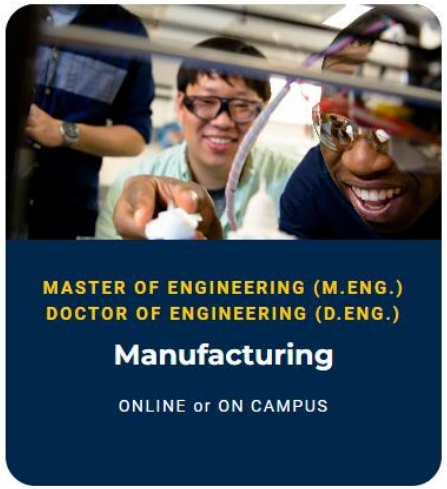
Energy Systems Engineering

ONLINE or ON CAMPUS

MASTER OF ENGINEERING (M.ENG.)

Global Automotive & Manufacturing Engineering (GAME)

ONLINE or ON CAMPUS



MASTER OF ENGINEERING (M.ENG.)
DOCTOR OF ENGINEERING (D.ENG.)

Manufacturing

ONLINE or ON CAMPUS

MASTER OF ENGINEERING (M.ENG.)

Systems Engineering + Design

ONLINE or ON CAMPUS

MASTER OF SCIENCE (M.S.)
DOCTOR OF PHILOSOPHY (PH.D.)

Design Science

ON CAMPUS

Rationale

- The proposed online M.Eng. in Construction Engineering and Management (CEM) program responds to market needs.

- Research by Capranos et al. (2021) indicates a strong preference among graduate students for online education, with approximately 80% considering alternative online programs if their preferred choice is not available.

- The data suggests that the job market for roles in the construction engineering and management sector is expanding
  - The Bureau of Labor Statistics forecasts a modest increase of 2-8% in the employment of construction managers, architecture and engineering managers, and civil engineers from 2021 to 2031, nationally
  - Specifically for Michigan, the growth is expected to be more robust at 8-12% over the same period
  - As the industry evolves, about one-third of these jobs will require a master's degree

Target Audience

The target audience for the proposed online M.Eng. in Construction Engineering and Management is domestic and international learners participating in the architecture, engineering and construction (AEC) industry

Based on research, the potential target audience consists of recent undergraduates and professionals returning to education, often with full-time jobs and family responsibilities

The online modality is designed to meet learners' need for affordability, reputable programming, engagement with quality faculty, a quick path to graduation, and flexible course options

The online modality allows students to complete the M.Eng. degree at a distance while living outside of Ann Arbor, maintaining their employment while being geographically dispersed, and with a level of flexibility often required for working professionals and adult learners

Curriculum Design

The M.Eng. in Construction Engineering and Management degree is a 26-credit program which requires at least 18 hours of graduate courses in Construction Engineering and Management (CEM), 6 hours of graduate courses in a Secondary area, and 2 hours of graduate seminars (at least one in CEM and/or up to one in a technical or management area related to CEM)

Key Program Standards: The Program Directors will work with ME-OPE to establish key program standards. Program standards establish consistency across program processes and plans to ensure a cohesive experience for prospective, admitted, and matriculated students, and provide guideposts for faculty teaching and administering the program

Faculty to Student Ratio: Courses will be designed for a faculty to student ratio consistent with best practices for online graduate-level students. Ideally, courses will be capped at 30-40 students in order to maintain quality interactions between faculty and students as well as among students

Regular and Substantive Interaction (RSI): Plans for RSI and faculty-initiated engagement between program faculty and students will be mapped out at the beginning of the course development process

Curriculum Design – Faculty Instructors from the Tishman Construction Management Program

Photios G. Ioannou

Vineet R. Kamat

David Kelly

SangHyun Lee

Carol C. Menassa

Curriculum Design

Core Curriculum: 15 Credits

- CEE 530 - Construction Professional Practice (3 credits)
- CEE 531 - Construction Cost Engineering (3 credits)
- CEE 532 - Advanced Construction Management (3 credits)
- CEE 536 - Project Planning Scheduling and Control (3 credits)
- CEE 435 - Building Information Modeling (3 credits)

Graduate Seminars: 2 Credits

- CEE 830 - Const Grad Seminar (1 credit) [must be taken twice over two terms]

Construction Elective: 3 Credits

Students may select from the list of courses below:

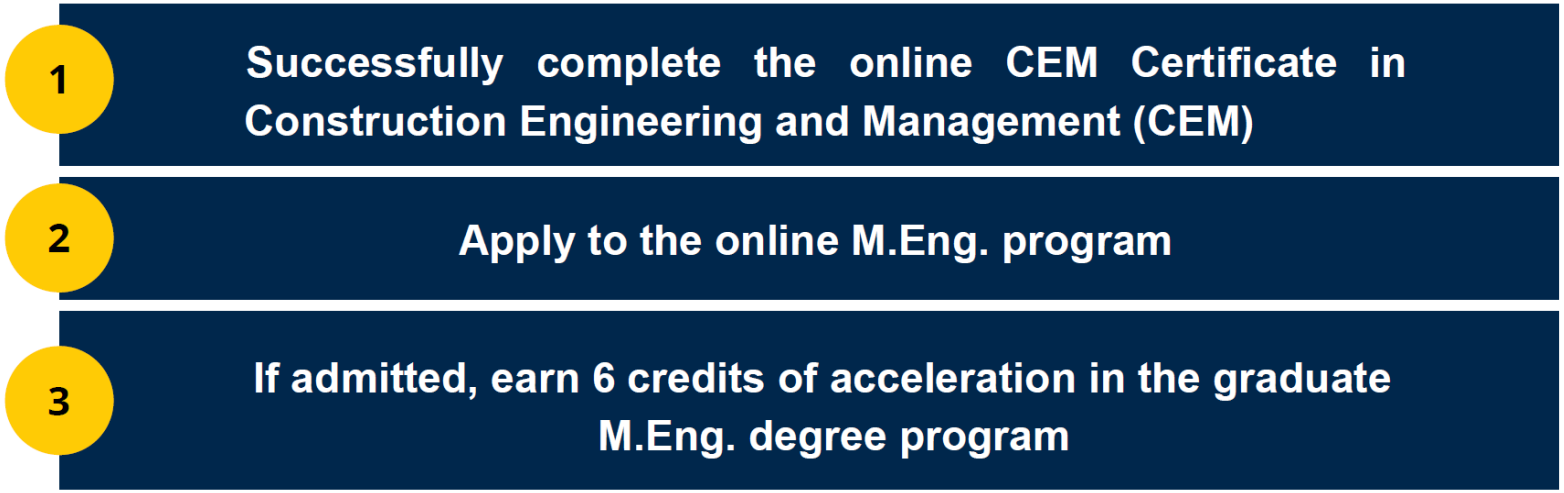
- CEE 534 - Construction Engineering, Equipment, and Methods (3 credits)
- CEE 537 - Construction of Buildings (3 credits)
- CEE 539 - Modern Construction Management (3 credits)
- CEE 555 - Sustainability of Civil Infrastructure Systems (3 credits)

Secondary Electives: 6 Credits

Students may select courses from the Construction Elective section above and other pre-approved courses in relevant disciplines. Examples include:

  - CEE 565/ESENG 501 - Seminars on Energy Sys, Tech, and Policy (3 credits)
  - CEE 567/ESENG 567 - Energy Infrastructure Systems (3 credits)

Stackable Credential



Online Certificate in Construction Engineering and Management:
https://nexus.engin.umich.edu/pro-ed/construction-eng-mgmt/

Admission and Scheduling Plans

- Application and Admission Requirements (Same as residential MEng)
- At the onset, there will be one admission cycle per year
- It is expected that Program administration will move to two intakes per year after the pilot first launch of the online program (and possibly three intakes per year in the future)
- Admission decisions will be made by the participating faculty
- Students in the program may complete the degree on a full-time basis in two academic semesters (one academic year) or on a part-time basis over the course of multiple academic years. Students who wish to complete the degree on a part-time basis will work closely with their academic advisors to develop a pathway to degree completion that meets their needs and time constraints
- All admission and other student services will be housed in CEE

Proposed Tuition Rate and Revenue Share

Tuition rate of $1,359 per credit x 26 credits ($35,334) for in-state learners and $1,505 per credit x 26 credits ($39,130) for out-of-state learners

These rates are commensurate with the current College of Engineering distance learning tuition rates but are proposed as a flat rate per credit in lieu of the previously used sliding scale

After recurring University assessments (Provost tax), program startup costs, and recurring program delivery costs (including GSI/IA and faculty compensation) are recovered by the College, net revenue will be split with the Department of Civil Engineering

Faculty Effort and Compensation

- Faculty effort and compensation for developing and teaching online classes comprises two components:
  - Initial content development and periodic refreshes
  - Course delivery

- Initial content development: ME-OPE is finalizing a fixed CoE-wide compensation rate for this with RPM and ADAA

- Course delivery: Faculty members will deliver online courses above and beyond their regular departmental teaching load. Faculty members will be compensated by ME-OPE for course delivery, based on established rates currently being finalized between ME-OPE, ADAA and RPM

Proposal for Online Delivery of the Existing Master of Engineering (M.Eng.) in Construction Engineering and Management (CEM)

Tishman Construction Management Program (TCMP)
Department of Civil and Environmental Engineering (CEE)
Michigan Engineering Online and Professional Education (ME-OPE)
The University of Michigan

December 2024

COLLEGE OF ENGINEERING
CIVIL & ENVIRONMENTAL ENGINEERING
UNIVERSITY OF MICHIGAN