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DOC 2020-08 - Proposal to the Academic Senate - Master of Construction Engineering and Management

University of Dayton. School of Engineering (Department of Civil and Environmental Engineering and Engineering Mechanics, School of Engineering University of Dayton.)

PROPOSAL TO THE ACADEMIC SENATE

TITLE: Master of Construction Engineering and Management

**SUBMITTED BY: Department of Civil and Environmental Engineering and Engineering Mechanics,
School of Engineering**

DATE: February 24, 2020

ACTION: Legislative Authority

**REFERENCE: DOC 2019-03 Actions Pertaining to Degree Programs and Academic Departments
(Revised)**

**A Full Proposal for
A New Graduate Program:
Master of Construction Engineering and Management
Mode of Delivery: On Campus**

**Submitted by:
Department of Civil and Environmental Engineering and Engineering
Mechanics
School of Engineering
University of Dayton**

February 24, 2020



**University of Dayton
School of
Engineering**

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1. BASIC CHARACTERISTICS OF THE EDUCATIONAL PROGRAM

a. Description of the Disciplinary Purpose and Significance of Proposed Degree

The Construction Engineering and Management (CEM) discipline specializes on two main themes: building construction projects in a safe, efficient and technically-sound manner and being an effective leader in an organization that plans and executes these projects. Modern construction projects present a variety of challenges in terms of relationships among various parties, meeting quality, cost and schedule goals and being a good “corporate citizen” in terms of health, safety and environmental standards. These challenges create the need for CEM as a discipline, which establishes professional activities that develop effective plans and strategies, employ state-of-the-art technologies, minimize risks and uncertainties on projects and guide the project to its success. Since projects come in various sizes and complexities, there is a need for a sophisticated approach to organize, plan and control project resources – which is at the center of what CEM provides.

Organizations that develop and build construction projects – which can be owners, engineering-construction firms or construction contractors – are seeking employees with advanced degrees who can actively contribute to the selection, planning, and execution of successful construction projects. These entities are looking for individuals who can contribute in various functions that lead to project (and company) success: assistance in corporate planning and developing strategies, planning of construction operations with an eye to create optimal efficiency and apply latest technologies, preparing proposals and bid, managing field operations and associated challenges related to safety, quality, material management, contracting and labor relations.

The proposed Master of Construction Engineering and Management (CEM) degree intends to educate students who already have a bachelor’s degree in civil engineering or a related engineering and/or management field by offering a unique graduate-level curriculum for developing technical competency and leadership skills to carry out activities in this discipline. The proposed program prepares students for careers in construction, engineering, and project management.

b. Definition of the Focus of the Program

The focus of the program is to provide professional-level education for graduate students who desire a career in construction.

The curriculum will emphasize learning in three key features that lead to success in the construction industry:

- Create and apply effective plans for construction;
- Create success in field efforts; and
- Lead an effective construction organization.

The curriculum is planned to be organized by distinctive CEM competencies of: fundamental skills, cost/time/risk management, management of construction efforts, construction process and data analytics. The curriculum is intended to be a blend of traditional knowledge and application of new technology and techniques to generate efficiency during the life of the construction project. The structure of the courses in the curriculum will use a variety of teaching techniques – ranging from traditional lecture, in-class exercises and simulations, and use of case studies from past construction projects to promote discussion and gain practical experience.

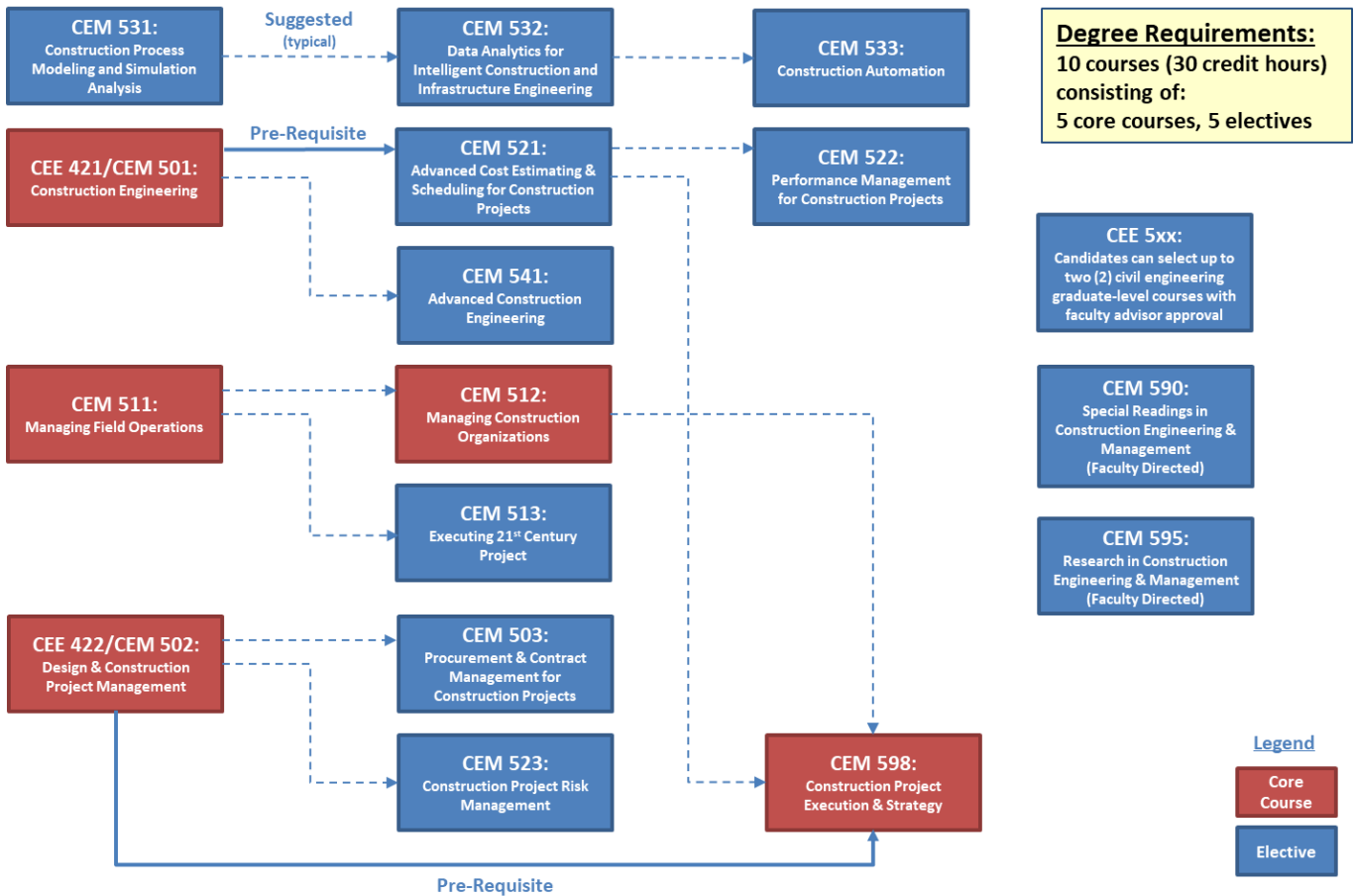
The program requires the master’s candidate to successfully complete ten (10) graduate courses: five (5) core courses and five (5) program electives, which can include current civil engineering graduate courses with faculty approval.

The five (5) core courses are:

1. *CEM 501: Construction Engineering* – which provides fundamentals of cost estimating and project scheduling;
2. *CEM 502: Design & Construction Project Management* – which provides a tour of all project management “body of knowledge” areas and introduces the concept of a project life-cycle;
3. *CEM 511: Managing Field Operations* – which covers management of a job site, including construction execution planning, both at a macro-level and at a micro-level (daily coordination of trades/contracts) and selection of construction equipment;
4. *CEM 512: Managing Construction Organizations* – which covers over-arching themes of safety, quality and managing productivity during construction as well as developing and managing an organization; and
5. *CEM 598: Construction Project Execution & Strategy* – which is a culminating experience to simulate use of high-performance teamwork to apply construction engineering and management on a case project from pre-construction through close-out.

The following diagram provides a high-level perspective of the flow of courses within the proposed curriculum. The core courses are designated with red boxes. The bold line represents pre-requisite links between courses and the dashed lines are the suggested progression across a series of courses – usually through a CEM competency.

Figure 1: Proposed Curriculum Flow for Master of CEM



c. Rationale for Degree Name

The discipline of Construction Engineering and Management has evolved over the years to a level that requires very focused, integrated, accumulated, experiential learning beyond the traditional training offered in Bachelor of Civil Engineering degree.

Within the design and construction community, the advanced degree in Construction Engineering and Management is a well-recognized “signal of competency” and currently in high demand. There is interest in this degree from graduates from other engineering and related-technical disciplines and having a distinguishable degree name of this nature is a very important to attract candidates.

d. Total Credit Hours for completion of the program:

The CEM is a non-thesis professional development degree that requires 30 credit hours of course work, which is consistent with ODHE, CCGS and University and School of Engineering policy.

e. Normal or Typical Length of Time for Students to Complete the Program:

Students can complete the required credits hours in three (3) semesters under normal conditions for full-time students. However, completion between 12 and 24 months is also possible depending on a student's background and course arrangement. To facilitate early graduation in 12 months, three summer courses (9 credit hours)—CEM 503 Procurement & Contract Management for Construction Projects, CEM 521 Advanced Cost Estimating & Scheduling for Construction Projects, CEM 541 Advanced Construction Engineering —will be regularly offered. The program is designed for full-time students, but part-time students will also have enough flexibility to enroll, although it will take longer to complete. This flexibility is provided by the scheduling of classes in late afternoon or evening to allow those working full-time to make advancement on this degree.

f. Proposed initial date for implementation of the program

The proposed date for implementation of the program is Fall Term of 2020. The program allows for either Fall or Spring Term starts. If the study starts in the Fall Term, the deadline to apply for admission is May 1 of the same year. If the study starts in Spring Term, the deadline to apply for admission is November 1 of the previous year.

g. Primary Target Audience for the Program and Admission Requirements

Domestic applicants must hold a bachelor's degree from a regionally accredited university or college. Applicants with a bachelor's degree from other countries will be admitted by faculty evaluation. Undergraduates from all engineering majors, particularly students from AEC (Architecture, Engineering, and Construction) majors, are the primary target audience for the program.

Application Requirements: All applicants should submit:

- Official undergraduate university transcript with GPA of 3.0 or above
- Official TOEFL score (or IELTS score) for international students. A minimum of 550 on TOEFL PBT, or 80 on the iBT TOEFL, or 6.5 on IELTS is required. International students with a U.S. undergraduate degree/graduate degree are exempted from TOEFL score. International students with a degree from another English-speaking country may be exempted from TOEFL or IELTS.

- Letter of reference (minimum two)
- Personal statement

In addition to the above documents, the CEM admission committee will also strongly consider applicants' prior experience in the industry. For example, experiences in the construction industry enhance his/her credential. The type of experiences can vary but those involving design and construction of projects would be strongly desired, especially work within a construction site.

Although industrial experience is not mandatory, applicants with such experience would receive preference, with other application considerations being equal.

h. Special Efforts to Enroll and Retain Underrepresented Groups

(1) Plan to ensure recruitment, retention and graduation of groups underrepresented within the discipline.

The Department of Civil and Environmental Engineering and Engineering Mechanics at UD has continued the concerted effort to recruit and retain students from the underrepresented groups. Such efforts include making special visits to inner city high schools and traditionally underrepresented colleges, offering special tutoring and mentoring opportunities to underrepresented groups, and providing an additional scholarship to underrepresented groups. We will continue to actively recruit students with diverse cultural, gender, and racial backgrounds. The University of Dayton has a marketing plan devoted to recruit underrepresented groups of students. The Construction Engineering and Management program will work closely with the University to recruit such students. The following list highlights our dedicated efforts to ensure recruitment, retention and graduations of underrepresented groups:

- The Diversity in Engineering Center (DEC): Dean Rojas created the Diversity in Engineering Center in 2016 to develop a focused, consistent culture of diversity within the SoE and to recruit, retain and graduate female and minority engineering Students. The DEC includes both the Minority Engineering Program (21 years in existence) and the Women Engineering Program (14 years in existence).
- The Minority Engineering Program (MEP) serves approximately 200 undergraduate students. The MEP builds community, promotes research and career exploration, and provides support and guidance to underrepresented minority students in engineering. Participation in MEP includes the following: Minority STEM Summer Bridge Program, PEERS Mentoring Program, Course Clustering, Collaborative Learning Workshops, first-year Academic Excellence Workshops, Sophomore Success Workshops, Individual Advising, and sustained engagement throughout entire undergraduate program in junior and senior years.
- The Women Engineering Program serves approximately 500 undergraduate students. The WEP helps students discover their passion in engineering and provides opportunities for networking, service, personal and academic growth

- **Minority STEM Summer Bridge Program:** The Minority STEM Summer Bridge Program (12 years in existence) provides the opportunity for incoming first-year minority students majoring in STEM fields to get a head start on their college experience during a week-long residential program. The program allows students to get acclimated to campus; preview calculus, chemistry, and physics courses; and connect with faculty, staff, and other incoming students before New Student Orientation and starting classes in the fall. Approximately 60 minority STEM students participate in this program each summer.

(2) Institution and departmental profiles of total enrollment and graduate student enrollment of underrepresented groups within the discipline:

Figure 1 illustrates the University of Dayton’s enrollment of underrepresented undergraduate students in the School of Engineering majors. The Department of Civil and Environmental Engineering and Engineering Mechanics has 37.4% of underrepresented students. They are also potential applicants for the proposed master program.

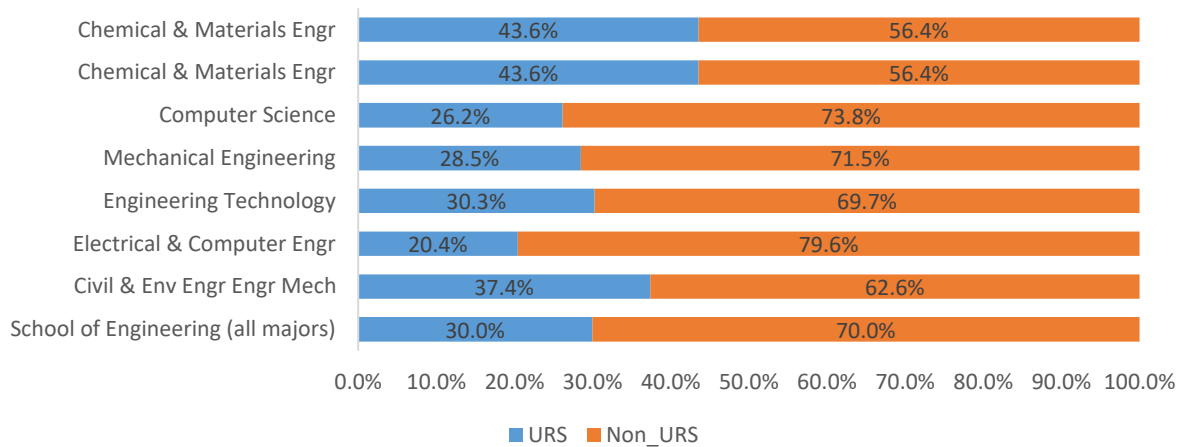


Figure 1. Enrolled underrepresented (URS) undergraduate students in 2018-2019 by major in the School of Engineering at the University of Dayton

Figure 2 shows the enrollment of underrepresented students in master programs in the School of Engineering. The Master of Civil Engineering program has a 23.1% of underrepresented students.

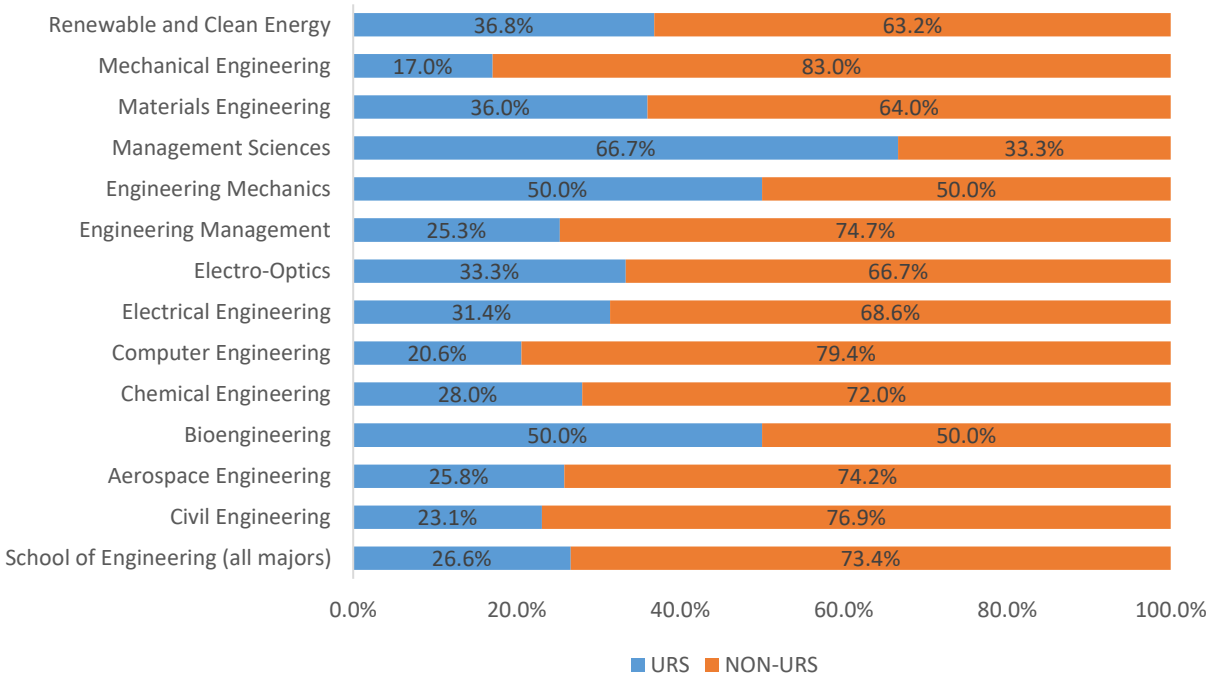


Figure 2. Enrolled underrepresented (URS) master graduate students in 2018-2019 by major in the School of Engineering at the University of Dayton

(3) Compare underrepresented groups degree recipients from the department and university at all levels compared to national norms.

The Bachelor's and Master's degree recipients of underrepresented groups from the School of Engineering majors are presented in Figures 3 and 4. In academic years of 2018-2019, the Civil and Environmental Engineering and Engineering Mechanics department conferred the Bachelor's and Master's degrees on underrepresented students 37.5% and 17.4%, respectively. Nationwide data to compare with our records has not been found.

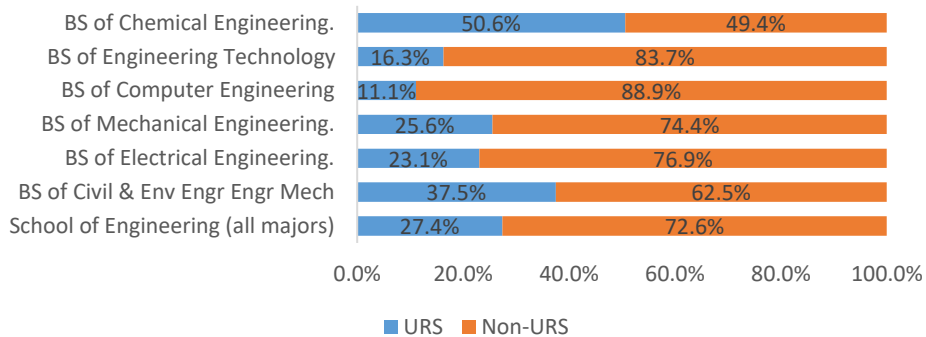


Figure 3. Bachelor's degree recipients in 2018-2019 by major the School of Engineering at the University of Dayton

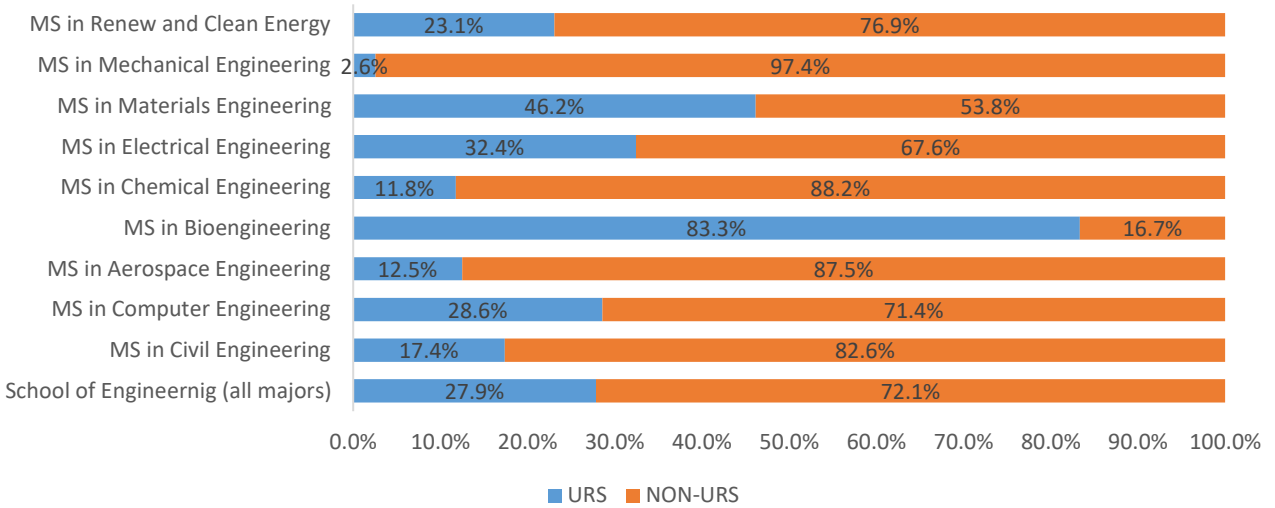


Figure 4. Master’s degree recipients in 2018-19 by major in the School of Engineering at the University of Dayton

2. INSTITUTIONAL PLANNING FOR THE PROGRAM

a. Physical Facilities, Equipment and Staff Needed to Support the Program

Faculty: The department currently has 10 tenured/tenure track civil engineering faculty members, supplemented by three full-time non-tenure track lecturers. These faculty together support the teaching of approximately 250 undergraduate and 40 graduate students in the civil engineering and engineering mechanics master’s programs. The department has already hired a full-time faculty of practice, Gerald P. Klanac, who will be the CEM program director and start his job in August 2020. We project the need for one additional full-time faculty member once the program has grown to a level where a second faculty member is needed (which would be about four years after launch). We also anticipate hiring adjunct faculty as additional resources, as their knowledge of current industry practice is very valuable for the graduates to be career ready.

Facilities: Facilities in the School of Engineering and classrooms in the Kettering Lab Building will be sufficient to accommodate the projected program size of 50 graduate students. Current civil engineering labs, including the Intelligent Infrastructure Lab and the Design Studio, provide adequate lab space for the program as well.

b. Evidence of a Market Exists for the New Program

The Market: According to the data presented in Statista¹, the construction industry is a mainstay of U.S. economy. Values added as a percentage of U.S. GDP has grown from 3.4 percent in 2009 to 4.1 percent in 2019. Construction spending has grown from \$800 billion in 2010 to almost \$1,300 billion in 2018. The outlook for construction spending has been projected to grow from \$1,400 billion in 2019 to \$1,500 Billion in 2022. The strong domestic demand for well-trained students with a master's degree in construction engineering and management is reported in the U.S. Bureau of Labor Statistics. Employment of construction managers is projected to grow 11 percent from 2016 to 2026, faster than the average for all occupations. Construction managers are expected to be needed to oversee the anticipated increase in construction activity over the coming decade. The rapid globalization of the world's construction engineering and management market, advancement of technological innovation in information management (e.g., Building Information Modeling), the great demand for experts in big data analytics, construction automation, and changing regulatory environments, have provided unprecedented opportunity for graduates with a construction engineering and management degree beyond the bachelor's level.

Increasing Popularity of Specialized Master's Degree Programs: Master's in the Construction Engineering and Management program prepares students for careers in construction, engineering, and project management. Candidates with a graduate degree in construction management qualify for senior positions in the construction industry. The construction engineering and management master's degrees produce construction managers with advanced project management and leadership skills specific to the field. Development projects increasingly demand construction managers with experience in large-scale management and construction technology. The Bureau of Labor Statistics (BLS) projects an 11% increase in job growth for construction managers through 2026. Construction managers with graduate degrees can choose from many positions, including private, commercial, and government project management. Managers specializing in construction can earn an average annual salary of more than \$91,000, with top earners in heavy and civil engineering construction and nonresidential building. The letters of support from construction companies can be found in **Appendix**.

Strong Demand from the International Communities: The globalization of the world's construction market creates strong demand for professionals with practical knowledge in construction engineering and management; such demand is particularly strong in emerging markets such as countries in the Middle East and Asia. Traditionally, the UD's CEE department has attracted a large number of students from foreign countries, such as the United Arab Emirates, Saudi Arabia, Kuwait, China, and India. We will continue to cultivate these existing reputations and broadening our recruiting efforts to form a student body with diverse internationals.

¹ Statista (2019) "U.S. Construction Industry - Statistics & Facts"
<https://www.statista.com/topics/974/construction/> (Accessed: Dec. 17th, 2019)

3. STATEWIDE ALTERNATIVES

a. Programs Available in Other Institutions

A survey of Ohio institutions that offer construction-related degrees is summarized in the table below. It can be seen that there are five institutions that offer degrees in the Associate of Applied Science (AAS) or B.S. in Construction Engineering Technology. There are three institutions that offer BS degree in Construction Management. Currently, Bowling Green State University offers the Master of Technology Management Degree program with construction specialization (MIT-CM).

In December 2019, Kent State University has submitted a proposal for the Master of Science Degree in Construction Management. The Kent State’s proposed degree is under the administration of the College of Architecture and Environmental Design. The program focuses on providing students the tools to solve the complex built environment issues and develop the skills to manage cross-disciplinary teams and organizations in the future. Moreover, there are public university’s civil engineering departments that offer M.S. in civil engineering with concentration in construction management, including Ohio State University, Ohio University, University of Toledo, Cleveland State University, University of Akron, and University of Cincinnati.

| INSTITUTION | COLLEGE | DEGREE |
|--|---|--|
| AAS, BSAS or B.S. in Engineering Technology Degrees | | |
| Ohio State University, ATI (Wooster campus) | College of Food, Agricultural and Environmental Sciences | Associate of Applied Science Degree – Construction Management |
| Youngstown State University | School of Engineering Technology | Bachelor of Science in Applied Science AAS (Associate of Applied Science) |
| | Department of Civil and Construction Engineering Technology | BSAS (Bachelor of Science in Applied Science) |
| University of Akron | Department of Engineering and Science Technology | Construction Engineering Technology (AAS and BS degrees) |
| University of Toledo | College of Engineering, Department of Engineering Technology | Bachelor of Science in Construction Engineering Technology |
| B.S. in Construction Management | | |
| Kent State University | College of Architecture and Environmental Design | Bachelor of Science in Construction Management |
| University of Cincinnati | College of Engineering and Applied Science, Department of Civil and Architectural Engineering and Construction Management | Bachelor of Science in Construction Management |
| Bowling Green State University | College of Technology, Architecture and Applied Engineering, School of the Built Environment, | Bachelor of Science in Construction Management |

| | | |
|--|---|--|
| | Department of Construction Management | |
| M.S. in Technology Management with Construction Specialization | | |
| Bowling Green State University | College of Technology, Architecture and Applied Engineering, School of the Built Environment, Department of Construction Management | Master of Technology Management degree in Construction Management Specialization (MIT-CM), Graduate Certificate in Construction Management (Five courses) |
| M.S. in Construction Management | | |
| Kent State University | College of Architecture and Environmental Design | Master of Science in Construction Management |

b. Appropriateness of Dayton for the New Program: Our Niche

Our geographic location in Dayton is within one-hour driving distance from three major metropolitan areas in Ohio: including Columbus, Cincinnati, and Dayton. Within a radius of this one-hour driving distance, there exist multiple construction companies whose employees could benefit from gaining an advanced degree in construction engineering and management.

c. Opportunities for Inter-Institutional Collaboration

We do not see significant duplication nor competition among Bowling Green State University’s, Kent State University’s offerings, and our proposed degree program; rather, we see complementary nature of the three master’s programs. Furthermore, there is large enough market for master’s degree in Construction Engineering and Management. We are, of course, open to all mutually beneficial collaborative opportunities that may arise.

4. GROWTH OF THE PROGRAM

Based on the reported national and global demand trends for master’s level training in construction engineering and management, we predict a long-term increase in students’ interest both domestically and internationally. Given the strong demand, the uniqueness of the program, and the recruiting effort, we are planning for a program size of 30 by the fourth year of the program, which is where we will cap the program given the planned resources. In the beginning of the program, all construction engineering and management courses will be delivered on the UD campus.

As indicated above, the existing facilities in Kettering Lab Building will be sufficient to meet the program demand; hence, no additional facilities are needed. We hired one full time faculty to serve as the program director and carry an appropriate course load. We will hire one additional full-time faculty as the program grows to the anticipated capacity (which would be about four years after launch). The major cost of implementing the program consists of one full-time faculty in the first year, and a second full-time faculty in the fourth year as the program grows to the expected enrollment capacity. In addition, hiring of adjunct faculty is anticipated. Both the Provost and Engineering Dean have indicated institutional commitment

to meet these needs (See attached letters from the Dean of the School of Engineering and the Provost at UD, respectively).

5. CURRICULUM AND INSTRUCTIONAL DESIGN

a. Curricular Content

The curriculum is composed of 15 credit hours of required core courses, including a 3-credit hour culminating and integrated experience course (CEM-598), and 15 credit hours of electives depending on students' desired career path. Table 1 summarizes the proposed curriculum for Construction Engineering and Management. The structure of the curriculum allows possible emphasis on specific competencies under the spectrum of construction engineering and management. There are five (5) courses designated as core courses for the master's degree (designated with ✓ in Core column in Table 1). The course description can be found in **Appendix C**.

Table 1: Proposed CEM Curriculum (December 2019)

| COURSE # | TITLE | CREDITS | CORE | NEW COURSE |
|--|--|---------|------|------------|
| CEM Competency: Fundamental Skills | | | | |
| CEM 501 | Construction Engineering | 3 | ✓ | |
| CEM 502 | Design & Construction Project Management | 3 | ✓ | |
| CEM 503 | Procurement & Contract Management for Construction Projects | 3 | | ✓ |
| CEM Competency: Management of Construction Efforts | | | | |
| CEM 511 | Managing Field Operations | 3 | ✓ | ✓ |
| CEM 512 | Managing Construction Organizations | 3 | ✓ | ✓ |
| CEM 513 | Executing 21 st Century Project: Sustainability, Lean Construction, CII Best Practices, BIM & Visualization | 3 | | ✓ |
| CEM Competency: Cost/Time/Risk Management | | | | |
| CEM 521 | Advanced Cost Estimating & Scheduling for Construction Projects | 3 | | ✓ |
| CEM 522 | Performance Management for Construction Projects | 3 | | ✓ |
| CEM 523 | Construction Project Risk Management | 3 | | ✓ |
| CEM Competency: Construction Process and Data Analytics | | | | |
| CEM 531 | Construction Process Modeling and Simulation Analysis | 3 | | ✓ |
| CEM 532 | Introduction to Data Analytics for Engineering Systems | 3 | | ✓ |
| CEM 533 | Construction Automation | 3 | | ✓ |
| Culminating Experiences | | | | |
| CEM 590 | Special Readings in Construction Engineering & Management | 3 | | ✓ |
| CEM 595 | Research in Construction Engineering & Management | 3 | | ✓ |

| | | | | |
|--|---|---|---|---|
| CEM 598 | Construction Project Execution & Strategy | 3 | ✓ | ✓ |
| Other Electives | | | | |
| From CEM Catalog of Courses | | | | |
| CEM 541 | Advanced Construction Engineering | 3 | | ✓ |
| From CEE Catalog of Courses (up to Two Courses with Faculty Approval) | | | | |
| CEE 502 | Pre-stressed Concrete | 3 | | |
| CEE 507 | Masonry Design | 3 | | |
| CEE 508 | Design Timber Structures | 3 | | |
| CEE 515 | Pavement Engineering | 3 | | |
| CEE 522 | Subsurface Investigation | 3 | | |
| CEE 524 | Foundation Engineering | 3 | | |
| CEE 525 | Soil Improvement | 3 | | |
| CEE 526 | Retaining Structure & Slopes | 3 | | |
| CEE 572 | Bayesian Machine Learning and Engineering Application | 3 | | |

b. Requirements for Completing the Program

The program of study for the degree of Master in Construction Engineering and Management must include a minimum of thirty (30) semester hours. The program of study must include:

- Fifteen (15) semester hours of core construction management courses, including three (3) semester hours of integrated, or cumulative, experience.
- Fifteen (15) semester hours of electives, which can come from the CEM curriculum or up to six (6) semester hours of graduate civil engineering courses with faculty approval.

c. Culminating, or Integrated Learning, Experience

In their final semester of the program, each student must fulfill the requirement of a culminating or integrated learning experience. It is expected most students will fulfill this requirement by taking Construction Project Execution and Strategy (currently designated as course CEM 598), which is a capstone experience to simulate construction management on a project from pre-construction through close-out. In this term-long simulation, students will gain experience in establishing construction execution strategies and plans early in the project and then further enhancing them as real-life challenges emerge as the project is being designed, procurement is underway, work is performed at the site and completed facilities are handed over to the ultimate owner/operator. Challenges to be experienced include: shifts in market conditions, changes in scope due to various causes, traditional change and claims, transitory nature of execution risks, dealing with wide variety of construction performance data and reacting to lack of performance issues, and delays from various sources.

Alternatively, students, with faculty approval and guidance, can develop a tailored in-depth study or research effort (currently designated as CEM 590 or 595) to create the culminating or integrated learning experience.

6. INSTITUTIONAL STAFFING, FACULTY, AND STUDENT SUPPORT

a. Faculty

The Department of Civil and Environmental Engineering and Engineering Mechanics has ten tenured/ tenure track faculty and three full time non-tenure track faculty to provide a comprehensive coverage of all civil engineering and construction management disciplines. In addition, faculty from the Master of Science in Engineering Management offer courses that form part of elective courses of the proposed in CEM program. We will hire one additional full-time faculty at the stage (Year 4) when the program grows to full enrollment capacity.

The director of the CEM program will be Gerald P. Klanac, who will become full-time faculty member starting in July 2020. Mr. Klanac, who holds a BCE from University of Dayton and MBA from University of Chicago (Finance, Policy Studies, Business Statistics), has been teaching part-time annually at University of Dayton since January 2003. Mr. Klanac has 39 years of construction project management experience initially within an international oil & gas company (ExxonMobil) and then within a project management consulting firm (PMA Consultants LLC), where he was managing director. Mr. Klanac has consulted on more than 100 construction projects world-wide and is an accomplished educator as he has been a key instructor within industry-leading project management training programs for BP, Marathon Petroleum, Abbott, Hoffmann-La Roche, Astra Zeneca, Eversource and Moscow School of Business (SKOLKOVO). Mr. Klanac brings unique and industry-recognized expertise in CEM areas of: cost estimating, project controls, construction planning & scheduling, risk management & analysis, contracting and contract strategy, administration and management of changes, claims and schedule delays, and construction organization development. Mr. Klanac has also presented technical papers at AACEI and PMI annual meetings.

Dr. Hongjo Kim was hired as a full-time assistant professor in August 2019 to mainly support the CEM program. He received his doctoral degree in the school of civil and environmental engineering at Yonsei University, Seoul, Korea with a specialization in construction management. Dr. Hongjo Kim has investigated interdisciplinary approaches such as computer vision, machine learning, and simulation to develop innovative construction engineering and management technologies for 7 years. While conducting his research for advanced construction management, he published 16 papers in top journals and 5 registered patents. Building on his expertise Dr. Hongjo Kim will teach state-of-the-art knowledge to help students learn and implement innovative construction engineering and management technologies. His expertise will make the CEM program's course offering unique and balance

between fundamental knowledge and new technologies in construction engineering and management.

The Department of Civil and Environmental Engineering and Engineering Mechanics has a strong capability to strengthen the CEM program in terms of construction engineering which is closely related to Civil Engineering disciplines such as Geotechnical, Structural, Concrete, and Transportation Engineering. The faculty members having extensive academic experience in these disciplines will provide 10 construction engineering-related courses in the CEM program. The faculty members consist of:

- Geotechnical Engineering – Dr. Robert Liang (34 years), Dr. Ömer Bilgin (15 years), and Dr. Hui Wang (2 years);
- Structural Engineering – Dr. Joseph Saliba (36 years);
- Concrete Engineering – Dr. Elias Toubia (10 years);
- Transportation Engineering – Dr. Deogratias Eustace (17 years)

Moreover, we have two faculty members with significant academic experience in construction management—Dr. Eddy Rojas and Dr. David Ashley. Dr. Eddy Rojas has published more than 80 journals and conference proceedings papers regarding (1) modeling, simulation and visualization, (2) construction economics and (3) engineering education. Dr. David Ashley has published more than 60 journal and conference papers in the construction project planning of large-scale, complex projects, designing and testing risk management responses to potential sources of cost overruns or delay, determination of factors leading to construction project success, project scope modeling, conceptual estimating, and innovative project delivery and financing approaches. Moreover, they are members of the National Academy of Construction (NAC)—a national organization that honors the best in the construction industry—which requires significant contributions to the effectiveness of the construction industry in order to become a member of the NAC. Although they are currently in administrative positions (Dean of School of Engineering – Dr. Eddy Rojas, Director of Industrial Relations – Dr. David Ashley), they will contribute to the development of the CEM program by teaching some parts of courses or advising the program management. The attached **Appendix** provides the faculty matrix and curriculum vitae.

b. Administration and Support

The administrative function of the program will be co-located within the Department of Civil and Environmental Engineering and Engineering Mechanics (CEE). The program director will be responsible for all administrative work (e.g., student advising) and assist the university in marketing and student recruiting. A program committee, consisting of the program director, department chair, CEE Department Graduate Studies Committee Chair and two faculties, will be responsible for curricular oversight and admission decisions. As the curriculum includes courses that are taught by faculty members in the Engineering Management master's program, we will cooperate with the program director to ensure full coordination of course offering.

7. ADDITIONAL INFORMATION REQUIRED FOR PROFESSIONAL GRADUATE DEGREE PROGRAMS

- a. What admission criteria, in addition to the traditionally required transcripts, standardized test scores, letter of recommendation, and personal statements of purpose, are relevant to assess the potential for academic and professional success of prospective students? Will there be special consideration of student experience and extant practical skills within the admission process? If so, please elaborate.**

All applicants must hold a bachelor's degree from an accredited university or college. Undergraduates from all engineering majors, particularly students from AEC (Architecture, Engineering, and Construction) majors, are the primary target audience for the program.

Application Requirements: All applicants should submit:

- Official undergraduate university transcript with GPA of 3.0 or above
- Official TOEFL score (or IELTS score) for international students. A minimum of 550 on TOEFL PBT, or 80 on the iBT TOEFL, or 6.5 on IELTS is required. International students with a U.S. undergraduate degree/graduate degree are exempted from TOEFL score. International students with a degree from another English-speaking country may be exempted from TOEFL or IELTS.
- Letter of reference (minimum two)
- Personal statement

In addition to the above documents, the CEM admission committee will also strongly consider applicants' prior experience in the industry. For example, experiences in the construction industry enhance his/her credential. The type of experiences can vary but those involving design and construction of projects would be strongly desired, especially work within a construction site. Although industrial experience is not mandatory, applicants with such experience would receive preference, with other application considerations being equal.

- b. Is field/clinical experience subsumed within the academic experience? If so, how does that experience relate to the academic goals of the professional graduate degree program? Provide a description of the involvement of supervisory personnel. Describe the nature of the oversight of the field/clinical experience by the academic department. Provide an outline of the anticipated student activities as well as student requirements.**

There is no direct field/clinical experience subsumed in the program. However, many of the courses will use case study experiences from actual projects to reinforce many of the knowledge areas. This is already a feature of CEE422, which will become CEM502 when the program is launched.

- c. Are the faculty qualifications associated with the professional graduate degree program appropriate for such faculty? Provide the specific qualifications for such faculty.**

Yes, the faculty members have the appropriate qualifications for this professional graduate degree program to provide the planned curriculum. New courses designed for the CEM program are mainly offered by two faculty members, Gerald P. Klanac and Dr. Hongjo Kim. Gerald P. Klanac has 39 years of construction project management experience with regards to cost estimating, project controls, construction planning & scheduling, risk management & analysis, contracting and contract strategy, administration and management of changes, claims and schedule delays, and construction organization development. Dr. Hongjo Kim has investigated new methods to manage construction projects using interdisciplinary technologies such as computer vision, simulation, machine learning, deep learning, and soft computing. The two faculty members are qualified for teaching the new courses in the program covering fundamental knowledges to emerging technologies in construction engineering and management. The other civil engineering faculty members—Drs. Robert Liang, Ömer Bilgin, Hui Wang, Joseph Saliba, Elias Toubia, Deogratias Eustace—have extensive academic experiences (19 years on average) in Geotechnical, Structural, Concrete, and Transportation Engineering, which qualify them for teaching elective construction engineering courses. The curriculum vitae of the faculty members can be found in the attached **Appendix**.

- d. How does accreditation by the appropriate professional organization relate to the academic curriculum and experience outlined in the program plan? Describe the specific aspects of the program plan, if any, that are necessary to achieve professional accreditation. Is completion of the degree program required for professional accreditation in the field?**

This degree program is not seeking accreditation from an external party. In terms of possible professional certification in the field of construction engineering and management (for instance from CMAA – Construction Management Association of America), the master degree is not a requirement.

- e. How are theory and practice integrated within the curriculum?**

The structure of the courses in the curriculum will use a variety of teaching techniques – ranging from traditional lecture, in-class exercises and simulations, and use of case studies from past construction projects to promote discussion and gain practical experience.

- f. What is the national credit hour norm for this degree program in your field? How was this norm derived? Is the number of credit hours required for graduation influenced by mandated professional experiences? If so, how?**

The CEM is a non-thesis degree that requires 30 credit hours of course work, which is consistent with national norms and University of Dayton/School of Engineering policy. This level of study is consistent with other programs around the country and expectations within the construction industry.

g. Describe the required culminating academic experience and how it will contribute to the enhancement of the student's professional preparation.

In their final semester of the program, each student must fulfill the requirement of a culminating or integrated learning experience. It is expected most students will fulfill this requirement by taking Construction Project Execution and Strategy (currently designated as course CEM 598), which is a capstone experience to simulate construction management on a project from pre-construction through close-out. In this term-long simulation, students will gain experience in establishing construction execution strategies and plans early in the project and then further enhancing them as real-life challenges emerge as the project is being designed, procurement is underway, work is performed at the site and completed facilities are handed over to the ultimate owner/operator. Challenges to be experienced include: shifts in market conditions, changes in scope due to various causes, traditional change and claims, transitory nature of execution risks, dealing with wide variety of construction performance data and reacting to lack of performance issues, and delays from various sources.

APPENDIX for a Proposal:
**Master Degree of Construction Engineering and
Management**

1. Faculty Matrix
2. Vitae for Each Faculty Member
3. CEM Program Course Descriptions
4. Fiscal Impact Statement
5. Market Analysis and/or Needs Survey
6. Letters of Support



University of Dayton
**School of
Engineering**

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1. FACULTY MATRIX

Ömer Bilgin, Associate Professor

Deogratias Eustace, Associate Professor

Hongjo Kim, Assistant Professor

Gerald P. Klanac, Faculty of Practice

Robert Liang, Professor

Joseph Saliba, Professor

Elias Toubia, Associate Professor

Hui Wang, Assistant Professor

1. FACULTY MATRIX

Listed below are the faculty members associated with CEM and CEE courses that would be part of the proposed curriculum.

| Instructor Name | Rank or Title | Full-Time (FT) or Part-Time (PT) | Instructor Qualification | | | Courses taught in the proposed program (Include course number and title) |
|--------------------|---------------------|----------------------------------|--|--|--|---|
| | | | Degree Title, Discipline Institution, Year | Years of Teaching Experience In the Discipline/Field | Additional qualifications (e.g., licenses, certifications) | |
| Ömer Bilgin | Associate Professor | FT | Ph.D., Civil Engineering, Cornell Univ. 1999 | 15 | PE in Massachusetts and California | CEE 526: Retaining Structures & Slopes CEE 522: Subsurface Investigation |
| Deogratias Eustace | Associate Professor | FT | Ph.D., Civil Engineering, Kansas State University, 2001 | 17 | PE in Ohio and Wisconsin | CEE 515: Pavement Engineering |
| Hongjo Kim | Assistant Professor | FT | PhD. Civil and Environmental Engineering, Yonsei Univ., 2018 | 1 | | CEM 501: Construction Engineering CEM 502: Design & Construction Project Management CEM 513: Executing 21st Century Project CEM 531: Construction Process Modeling and Simulation Analysis CEM 533: Construction Automation CEM 595: Research in Construction Engineering & Management |

| | | | | | | |
|------------------|---------------------|----|--|----|---------------------------|---|
| Gerald P. Klanac | Faculty of Practice | FT | MBA Finance, Policy Studies and Business Statistics, Univ. of Chicago, 1987; BSc. Civil Engineering, Univ. of Dayton, 1978 | 20 | | CEM 503: Procurement & Contract Management for Construction Projects CEM 511: Managing Field Operations CEM 512: Managing Construction Organizations CEM 521: Advanced Cost Estimating & Scheduling for Construction Projects CEM 522: Performance Management for Construction Projects Engineering & Management CEM 598: Construction Project Execution & Strategy |
| Robert Liang | Professor | FT | PhD., Civil Engineering, Univ. of California, Berkeley, 1985 | 34 | PE in Ohio and California | CEM 523: Construction Project Risk Management CEE 524: Foundation Engineering CEE 525: Soil Improvement |
| Joseph Saliba | Professor | FT | PhD. Civil Engineering, Univ. of Dayton, 1983 | 36 | PE in Ohio | CEM 541: Advanced Construction Engineering CEM 590: Special Readings in Construction CEE: 507: Masonry Design |
| Elias Toubia | Associate Professor | FT | Ph.D., Civil Engineering, Univ. of Dayton | 10 | | CEE 502: Pre-stressed Concrete CEE: 508 Design Timber Structures |
| Hui Wang | Assistant Professor | FT | Ph.D. Civil Engineering, University of Akron, 2015 | 2 | | CEM 532: Introduction to Data Analytics for Engineering Systems CEE 572: Bayesian Machine Learning and Engineering Application |

2. VITAE FOR EACH FACULTY MEMBER

Ömer Bilgin, Associate Professor

Deogratias Eustace, Associate Professor

Hongjo Kim, Assistant Professor

Gerald P. Klanac, Faculty of Practice

Robert Liang, Professor

Joseph Saliba, Professor

Elias Toubia, Associate Professor

Hui Wang, Assistant Professor

2. VITAE FOR EACH FACULTY MEMBER

ÖMER BILGIN, Ph.D., P.E.

PROFESSIONAL LICENSES

Registered Professional Engineer (Civil) – Massachusetts (2002–present)

Registered Professional Engineer (Civil) – California (2005–present)

EDUCATION

| | | | | |
|-------|------|-------------------------------|----------------------|-------------------|
| Ph.D. | 1999 | Cornell University | Ithaca, New York | Civil Engineering |
| M.S. | 1994 | Oklahoma State University | Stillwater, Oklahoma | Civil Engineering |
| B.S. | 1991 | Orta Dogu Teknik Universitesi | Ankara, Turkey | Civil Engineering |

ACADEMIC EXPERIENCE

2009 – Present Associate Professor (formerly Assistant Professor), Department of Civil & Environmental Engineering, University of Dayton, Dayton, Ohio

2004 – 2009 Assistant Professor, Department of Civil & Environmental Engineering, University of Houston, Houston, Texas

INDUSTRIAL EXPERIENCE

2003–2004 Engineer, Exponent Failure Analysis Associates
Los Angeles, California

1999–2003 Geotechnical Engineer, Camp Dresser and McKee (CDM)
Cambridge, Massachusetts

1991–1993 Civil Engineer, BOTAS Petroleum Pipeline Corporation, Ankara, Turkey

EDITORIAL POSITIONS

Associate Editor, Journal of Materials in Civil Engineering, American Society of Civil Engineers (2011–present)

Editorial Board Member, Geotextiles and Geomembranes, Elsevier (2015–present)

RESEARCH INTERESTS AND EXPERTISE

Foundations, retaining structures, pipelines, geosynthetics, soil-structure interaction, soil dynamics and earthquake engineering, physical and numerical modeling, soft soils, ground improvement, thin-shells with infill structures

TEACHING INTERESTS AND EXPERTISE

Geotechnical engineering, geotechnical engineering laboratory, foundation engineering, subsurface investigations, retaining structures and slopes, soil dynamics and earthquake engineering

PROFESSIONAL AFFILIATIONS

- Member, American Society of Civil Engineers (1994–present)
- Member, Geo-Institute (1999–present)
- Member, International Society for Soil Mechanics and Geotechnical Engineering (1999–present)
- Member, United States Universities Council on Geotechnical Education & Research (2004–present)
- Member, Network for Earthquake Engineering Simulation (2006–present)
- Member, North American Geosynthetics Society (2016–present)

PUBLICATIONS

- Bilgin, Ö. Arens, K. and Dettloff, A. (2019). "Assessment of variability in soil properties from various field and laboratory tests." *Georisk: Assessment and Management of Risk for Engineered Systems and Geohazards*, Taylor & Francis. Vol. 13, No. 4, 247-254, DOI: 10.1080/17499518.2019.1645338.
- Bilgin, Ö., Tsimbelman, N., Chernova, T. (2017). "Variability in recompression index obtained from incremental consolidation tests." *Proceedings, 19th International Conference on Soil Mechanics and Geotechnical Engineering (19th ICSMGE)*, Seoul, Korea, 317-320.
- Tsimbelman, N. Ya., Chernova, T. I., and Bilgin, Ö. (2016). "Theoretical model for the stability of soils under shell gravity structures." *Proceedings, Twenty-sixth (2016) International Ocean and Polar Engineering (ISOPE) Conference*, Rhodes, Greece, Vol. 2, 789-796.
- Bilgin, Ö., Arens, K., Salveter, M., and Dettloff, A. (2015). "Spatial variability of subsurface soil conditions causing roadway settlements." *Proceedings, ISGSR 2015: Geotechnical Safety and Risk V*, Rotterdam, The Netherlands, 165-171.
- Bekker, A. T., Tsimbelman, N. Ya., Chernova, T. I., Bruss, V. D., and Bilgin, Ö. (2015). "Interface friction parameters for the mathematical modeling of shell structures with infill." *Proceedings, Twenty-fifth (2015) International Ocean and Polar Engineering (ISOPE) Conference*, Kona, Big Island, Hawaii, Vol. 1, 1905-1912.
- Bilgin, Ö. (2014). "Modeling viscoelastic behavior of polyethylene pipe stresses." *Journal of Materials in Civil Engineering*, ASCE. Vol. 26, No. 4, 676-683.
- Bilgin, Ö., and Mansour, E. (2014). "Effect of reinforcement type on the design reinforcement length of mechanically stabilized earth walls." *Engineering Structures*. Elsevier. Vol. 59, No. 2, 663-673.
- Bilgin, Ö., and Mansour, E. (2013). "Variability of soil properties and reliability of empirical equations on soil settlement predictions." *Foundation Engineering in the Face of Uncertainty – Honoring Fred H. Kulhawy (GSP 229)*, ASCE, 298-307.
- Bilgin, Ö. (2012). "Lateral earth pressure coefficients for anchored sheet pile walls." *International Journal of Geomechanics*, ASCE. Vol. 12, No. 5, 584-595.
- Bilgin, Ö. (2010). "Numerical studies of anchored sheet pile wall behavior constructed in cut and fill conditions." *Journal of Computers and Geotechnics*, Elsevier. Vol. 37, No. 3, 399-407.
- Bilgin, Ö., and Stewart, H. E. (2009). "Pullout resistance characteristics of cast iron pipe." *Journal of Transportation Engineering*. ASCE. Vol. 135, No. 10, 730-735.
- Bilgin, Ö. (2009). "Failure mechanisms governing reinforcement length of geogrid reinforced soil retaining walls." *Engineering Structures*. Elsevier. Vol. 31, No. 9, 1967-1975.
- Bilgin, Ö., and Stewart, H. E. (2009). "Design guidelines for polyethylene pipe interface shear resistance." *Journal of Geotechnical and Geoenvironmental Engineering*. ASCE. Vol. 135, No. 6, 809-818.

SYNERGISTIC ACTIVITIES

- Certified Safety Assessment Program volunteer for the State of California Office of Emergency Services. Post-disaster safety assessment trained by the State of California (2004–present).
- Conference Technical Session Organizer/Chair/Moderator: Geosynthetics Conference 2019, Houston, Texas; International Foundation Congress & Equipment Expo (IFCEE) 2015, San Antonio, Texas; 2014 Geo-Congress: Geo-Characterization and Modeling for Sustainability, Atlanta, Georgia, (two sessions); 2013 Geo-Congress: Stability and Performance of Slopes and Embankments III, San Diego, California, (two sessions); Geotechnical Risk Assessment and Management, Atlanta, Georgia, 2011 (two sessions).

Deogratias Eustace, Ph.D., P.E., PTOE

EDUCATION

Doctor of Philosophy in Civil Engineering, Kansas State University - 2001

- Specialization: Transportation Engineering

Master of Science in Civil Engineering, University of Dar-Es-Salaam, Tanzania - 1997

- Specialization: Transportation Engineering.

Bachelor of Science in Engineering (Honors), University of Dar-Es-Salaam, Tanzania – 1992

- Civil Engineering.

PROFESSIONAL REGISTRATION AND CERTIFICATION

- Registered Professional Engineer (P.E.), State of Ohio, Reg. No. 67791 (2003 - present).
- Registered Professional Engineer (P.E.), State of Wisconsin, Reg. No. 42180 (2012 - present).
- Certified Professional Traffic Operations Engineer (PTOE), Reg. No. 1378 (2004 - present).

EMPLOYMENT HISTORY

- Associate Professor, University of Dayton (2011 - present)
- Assistant Professor, University of Dayton (2005 - 2011)
- Transportation Engineer, URS Corporation, Tallahassee, FL (2002 - 2005).
- Research Associate and Instructor, Civil Engineering Dept., Kansas State University (2001 –2002)
- Development Engineer, Civil Engineering Dept., University of Dar-Es-Salaam - (1992 - 1997).

RESEARCH INTERESTS

Include traffic safety; traffic operations analysis; traffic forecasting, demand modeling and land use; urban transportation planning, non-motorized transportation studies; drivers and vehicles characteristics; and statistical applications in transportation engineering.

PUBLICATIONS

1. Eustace, D., F. Alanazi, and P.W. Hovey. "Investigation of the Effect of Vehicle Color on Safety," *Advances in Transportation Studies an International Journal*. Volume 47, Section B, pp. 77-88, 2019.
2. Azimian, A. and D. Eustace. "Modeling Socio-economic Determinants of Traffic Fatalities," *International Journal of Engineering Research and Management*, Volume 05, Issue 11, pp. 1-5, 2018.
3. Eustace, D., O. Almutairi, and P.W. Hovey. "Modeling of Factors Contributing to Injury and Fatality of Run-off-road Crashes in Ohio," *Advances in Transportation Studies an International Journal*, Volume 40, Section B, pp. 53-68, 2016.
4. Eustace, D., Aylo, A., and Mergia, W.Y. "Crash Frequency Analysis of Left-side Merging and Diverging Areas on Urban Freeway Segments - a Case Study of I-75 Through Downtown Dayton, Ohio," *Transportation Research Part C*, Volume 50, pp. 78-85, 2015.
5. Mergia, W. Y., D. Eustace, D. Chimba, and M. Qumsiyeh. "Exploring Factors Contributing to Injury Severity at Freeway Merging and Diverging Locations in Ohio," *Accident Analysis and Prevention*, Volume 55, pp. 202-210, 2013.
6. Eustace, D. and V.K. Indupuru. "A Simplified Method for Analyzing Factors Contributing to Motorcyclists' Fatal Injuries in Ohio," *Advances in Transportation Studies an International Journal*, Volume 24, Section B, pp. 85-96, 2011.
7. Eustace, D., V. K. Indupuru and P. Hovey. "Identification of Risk Factors Associated with Motorcycle Related Fatalities in Ohio," *Journal of Transportation Engineering*, Volume 137, No. 7, pp. 437-480, 2011.
8. Eustace, D., V. K. Indupuru, and S. Owusu-Ansah "An Exploratory Survey of Drivers' Knowledge of Right-of-Way at Freeway On-ramp Merging Area," *ITE Journal*, Volume 80, Issue 11, pp. 36-43, 2010.

9. Eustace, D., V. Griffin, and P. Hovey, "Analyzing the Effects of L.E.D. Traffic Signals on Urban Intersection Safety," *ITE Journal*, Volume 80, Issue 4, pp. 22-27, 2010.
10. Eustace, D. and H. Wei, "The Role of Driver Age and Gender in Motor Vehicle Fatal Crashes," *Journal of Transportation Safety and Security*, Volume 2, Number 1, pp. 28-44, 2010.
11. Eustace, D., E. R. Russell and E. D. Landman, "Application of Robustness Analysis for Developing a Procedure for Better Urban Transportation Planning Decisions," *Journal of the Transportation Research Forum*, Volume 57, Number 1, pp. 107-122, 2003.
12. Eustace, D. and T. M. C. Bartel, "Seat Belt Use Compliance in Kansas," *Journal of the Transportation Research Forum*, Volume 56, Number 4, pp. 149-160, 2002.
13. Eustace, D., "Pedestrian Reaction to Crossing Signal Delay," *Journal of the Transportation Research Forum*, Volume 40, No. 1, pp. 117-128, 2001.
14. Eustace, D., "Performance Comparison of a Roundabout Versus Two-Way Stop Controlled (TWSC) Intersections," *Journal of Missouri Valley Section of the Institution of Transportation Engineers*, December 2000, pp. 16-25, 2000.

BOOK AND CHAPTER BOOK PUBLICATION

- Eustace, D., and S. Dissanayake. (2016) "Risk and Protective Factors Associated with Motorcycle Injury Severity in the United States." In *Traffic Accidents and Safety: New Research*. (Bowman, G., Editor), pp. 81-102, Nova Science Publishers, Inc., Hauppauge, NY. ISBN: 978-1-63485-517-4.
- Eustace, D., E. R. Russell, and E. D. Landman. (2012). "Incorporating Robustness Analysis into Urban Transportation Planning Decision Process." In *Network Reliability in Practice* (D. M. Levinson, H. X. Liu & M. Bell, Editors), pp. 97-114, Springer, NY. ISBN: 978-1-4614-0946-5; e-ISBN 978-1-4614-0947-2.
- Eustace, D. (2009). *Urban Transportation Planning Decision Making: A Robustness Analysis Approach*. VDM Verlag Dr. Müller Aktiengesellschaft & Co. KG. ISBN: 978-3-639-11990-9.

AWARDS AND ACCOMPLISHMENTS

1. Fellow of the Carnegie African Diaspora Fellowship Program, 2016.
2. American Statistical Association, Section on Physical & Engineering Sciences (SPES) (2010). "Outstanding Poster Presentation Award Runner-Up" for a Paper titled "Are Some Vehicle Colors Safer than Others?" (Co-authored with Dr. Peter Hovey and Stephen Owusu-Ansah).
3. Sisters of Phi Sigma Rho National Engineering Sorority, University of Dayton (2008) – "Best Male Professor"
4. Florida's Turnpike Enterprise Planning and Production (2005). "I Made a Difference" Award.

PROFESSIONAL MEMBERSHIP

- Member, American Society of Civil Engineers (ASCE)

SYNRTGISTIC ACTIVITIES

- University Representative to Transportation Research Board (TRB) (2012 - present)
- Steering Committee Member, Transportation Statistics Interest Group (TSIG) (2012 - present)
- Member, TRB's Standing Committee on Statistical Methods (ABJ80) (2014 - present)
- Member, ASCE's Transportation Safety Committee (ASCE-Safety) (2014 - present)
- Vice-Chair, ASCE's Transportation Safety Committee (ASCE-Safety) (2017 - present)

Hongjo Kim, Ph.D.

Assistant Professor, Department of Civil and Environmental Engineering and Engineering Mechanics, University of Dayton

Education

2013. 3. ~ 2018. 2. Ph.D. in the School of Civil and Environment Engineering, Yonsei University,
2009. 3. ~ 2013. 2. Bachelor in the School of Civil and Environment Engineering, Yonsei University

Professional Employment

2019 ~ Present Assistant Professor, Department of Civil and Environmental Engineering and Engineering Mechanics, University of Dayton, OH, United States
2018 ~ 2019 Research Associate, Department of Construction Science, Texas A&M University, College Station, Texas, United States
2018 ~ 2019 Research Associate, School of Civil and Environmental Engineering, Yonsei University, Seoul, South Korea

Teaching and Research

My teaching and research interests are focused on Artificial Intelligence-based Data-Driven Construction and Infrastructure Management. The goal of my research is to investigate new knowledge in construction and infrastructure management for the improvement of productivity and safety from the perspective of information management using computer vision, simulation, and artificial intelligence. I incorporate the findings of my research into the following classes that will be offered in the proposed degree program—Master of Construction Engineering and Management:

- CEM 501 Construction Engineering
- CEM 511 Construction Process Modeling and Simulation Analysis
- CEM 512 Introduction to Data Analytics for Engineering Systems

Publications

1. **Hongjo Kim** and Youngjib Ham (2019). "Participatory sensing-based geospatial localization of distant objects for disaster preparedness in urban built environments." *Automation in Construction*, 107, 102960.
2. Hoyoung Jeong, **Hongjo Kim**, and Hyoungkwan Kim (2019). "Optimization procedure for climate change adaptation investment planning: Case of flood disaster prevention in Seoul" *Journal of Water Resources Planning and Management*. (Accepted)
3. Seongdeok Bang, Somin Park, **Hongjo Kim**, and Hyoungkwan Kim (2019). "Encoder-Decoder Network for Pixel-Level Crack Detection in Black-Box Images" *Computer-Aided Civil and Infrastructure Engineering*, 34, 713–727.
4. **Hongjo Kim**, Youngjib Ham, Wontae Kim, Somin Park, and Hyoungkwan Kim (2019). "Vision-based Nonintrusive Context Documentation for Earthmoving Productivity Simulation" *Automation in Construction*, 102, 135–147.

5. Somin Park, Seongdeok Bang, **Hongjo Kim**, and Hyoungkwan Kim (2018). "Patch-based Crack Detection in Black Box Images using Convolutional Neural Networks" *Journal of Computing in Civil Engineering*, 33(3), 04019017.
6. **Hongjo Kim**, Seongdeok Bang, Hoyoung Jeong, Youngjib Ham, and Hyoungkwan Kim (2018). "Analyzing Context and Productivity of Tunnel Earthmoving Processes using Imaging and Simulation" *Automation in Construction*, 92, 188–198.
7. Inhae Ha, **Hongjo Kim**, Somin Park, and Hyoungkwan Kim (2018). "Image Retrieval using BIM and Features from Pretrained VGG Network for Indoor Localization" *Building and Environment*, 140, 23–31.
8. **Hongjo Kim**, Hyoungkwan Kim, Yong Won Hong, and Hyeran Byun (2018). "Detecting Construction Equipment Using a Region-based Fully Convolutional Network and Transfer Learning" *Journal of Computing in Civil Engineering*, 32(2), 04017082.
9. **Hongjo Kim** and Hyoungkwan Kim (2018). "3D Reconstruction of Construction Entities for Training Object Detectors" *Automation in Construction*, 88, 23–30.
10. Seongdeok Bang, **Hongjo Kim**, and Hyoungkwan Kim (2017). "UAV-based Automatic Generation of High-Resolution Panorama at a Construction Site with a Focus on Preprocessing for Image Stitching" *Automation in Construction*, 84, 70–80.
11. Kinam Kim, **Hongjo Kim**, and Hyoungkwan Kim (2017). "Image-based Construction Hazard Avoidance System using Augmented Reality in Wearable Device" *Automation in Construction*, 83, 390–403.
12. Sooji Ha, **Hongjo Kim**, Kyeongseok Kim, Hyounkyu Lee, and Hyoungkwan Kim (2017). "Algorithm for Economic Assessment of Infrastructure Adaptation to Climate Change" *Natural Hazards Review*, 16(4), 04017007.
13. Hoyoung Jeong, **Hongjo Kim**, Kyeongseok Kim, and Hyoungkwan Kim (2017). "Prediction of Flexible Pavement Deterioration in Relation to Climate Change Using Fuzzy Logic" *Journal of Infrastructure Systems*, 23(4), 04017008.
14. **Hongjo Kim**, Kinam Kim, and Hyoungkwan Kim (2016). "Data-driven Scene Parsing Method for Recognizing Construction Site Objects in the Whole Image" *Automation in Construction*, 71(2), 271–282.
15. **Hongjo Kim**, Kinam Kim, and Hyoungkwan Kim (2016). "Vision-Based Object-Centric Safety Assessment Using Fuzzy Inference: Monitoring Struck-By Accidents with Moving Objects" *Journal of Computing in Civil Engineering*, 30(4), 04015075.
16. Byungil Kim, **Hongjo Kim**, and Hyoungkwan Kim (2016). "A Framework for Pricing the Loss of Regulating Ecosystem Services Caused by Road Construction" *Korean Society of Civil Engineers Journal of Civil Engineering*, 20(7), 2624–2631.
17. **Hongjo Kim**, Changyoon Kim, Hoyoung Jeong, Sooji Ha, Kinam Kim, and Hyoungkwan Kim (2015). "4D CAD Drawings based on Marker-based Augmented Reality" *Korean Journal of Construction Engineering and Management*, 16(4), 30–40.

Gerald P. Klanac

Faculty in Practice, Director of Construction Engineering and Management Program (starting July 2020), Department of Civil and Environmental Engineering and Engineering Mechanics, University of Dayton

Education

- MBA (Finance, Policy Studies, Business Statistics), University of Chicago Graduate School of Business, March 1989
- Bachelor of Civil Engineering, University of Dayton, April 1978, magna cum laude

Academic Experience

- 2002 to present: University of Dayton School of Engineering, Part-Time Faculty within Department of Civil and Environmental Engineering and Engineering Mechanics

Industrial Experience

- 1989 – present, serves as Managing Director with PMA Consultants LLC, Ann Arbor, Michigan. Currently responsible for development of PMA’s project management consulting teams in Ann Arbor and Houston, Texas. Also responsible for expanding PMA domestic and international consulting services in the oil and gas, petrochemical, and pharmaceutical industries. Has led or participated in PMA consulting teams that perform CPM schedule development and analysis; progress payment reviews; project cost/schedule controls (analysis, forecasting & reporting); expert evaluation of claims (including loss of productivity issues); development of project management processes and procedures; and auditing project team performances. Since 2000, has conducted cost and schedule risk analysis on more than 100 oil and gas, petrochemical, and pharmaceutical projects with cumulative value of over \$50 billion.

Mr. Klanac has significant expertise in project cost/schedule controls, developing and analyzing CPM schedules, developing and reviewing conceptual and definitive cost estimates, developing cost estimating tools, assessing and reviewing construction labor productivity, expert analysis and evaluation of change orders and claims, developing project management processes, preparing contract strategies, and probabilistic analysis of cost estimates and schedules. His additional skills include facilitation and project management training.

- 1978 – 1987, served as senior cost/schedule engineer with Exxon Research & Engineering Company, Florham Park, New Jersey. Performed project cost/schedule controls duties for three separate projects at Esso Petroleum’s refinery in southern England. Performed worldwide coordination and development of Exxon’s proprietary cost estimating software, including new user training. Led or participated in conceptual and detailed cost estimates for refinery expansions in Baytown, Texas, southern England and southern Australia.

TEACHING and RESEARCH

Teaching within university setting has been part-time at University of Dayton for CEE422, Design and Construction Project Management. Teaching at the industry level includes:

- Lead Facilitator at BP Way (2008-2015) which was a two-week residential project management training course delivered in Houston, Texas – topics presented include: procurement and contracting, project organization strategy, schedule risk analysis, construction execution planning, and interface and relationship management.
- Lecturer for Moscow School of Business (SKOLKOVO) for several courses provided in Russia, UAE and Uzbekistan regarding project management for Lukoil Overseas.
- Created and successfully delivered project controls, cost estimating and scheduling courses for several clients: BP Pipelines, Marathon Petroleum, Astra Zeneca, Abbott, Panhandle Energy, and Hoffman LaRoche. Course were delivered in the U.S. as well as several international locations.

Publications & Lectures

- “Innovative Claims and Disputes Avoidance” with Dr. Gui Ponce de Leon, P.E. and Timothy C. McManus, Chapter 3 of *Hazardous Waste Cost Control*, edited by Richard Selg, Marcel Dekker, Inc., 1993
- “Liquidated Damages for Multi-Prime Projects,” American Association of Cost Engineers, Transactions, Dearborn, Michigan, with Dr. Gui Ponce de Leon, P.E. and William Edwards, July 1993.
- “Using Multiple Regression to Analyze a Contractor’s Schedule of Values,” with Dean F. Schoeder and John R. Spittler, P.E., American Water Works Association, Los Angeles, California, April 1994.
- “Avoiding Claims” with Dr. Gui Ponce de Leon, P.E., John R. Knoke, and Timothy C. McManus, Chapter 24 of *The Engineer’s Cost Handbook, Tools for Managing Project Costs*, edited by Richard E. Westney, P.E., 1997
- “Controlling Project Costs & Time: Suggestions for Architects & Engineers,” with John R. Spittler, P.E., presentation to Cleveland Consulting Engineers Association and Cleveland Chapter of AIA, March 1997
- “How Accurate Are Piping Estimating Methods?” American Association of Cost Engineers, Transactions, Denver, Colorado, with Chris P. Caddell and Thomas J. Rye, June 1999.
- “Loss of Productivity Claims” with Eric L. Nelson, presentation to Houston/Gulf Coast Chapter of Association for Advancement of Cost Engineering International, March 2003.
- “Applying Schedule Risk Analysis for Setting Appropriate Project Time Expectations: Two Case Studies”, PMI College of Scheduling Conference, Montreal, Canada, April 2004.
- “Risk Assessment: Value of the Process” with Christopher P. Caddell, P.E. and Sherri Crepinsek, Association for Advancement of Cost Engineering International, Transactions, Washington D.C., June 2004
- “Trends In Construction Lost Productivity Claims” with Eric L. Nelson, ASCE Journal of Engineering Education, July 2004

Professional Engineer (PE) Registration in California and Ohio.

Education

- Ph.D., 1985, Department of Civil Engineering, University of California, Berkeley, CA.
- M.S., 1979, Department of Civil Engineering, North Carolina State University, Raleigh, NC.
- B.S., 1974, Department of Civil Engineering, Tam Kang University, Taipei, Taiwan.

Academic Experience

- 2016 – present, Professor and Department Chair, Department of Civil Engineering, University of Dayton
- 1985 - 2016, Assistant Professor, Associate Professor, Professor, Department Chair, and Distinguished Professor at different stages of career at the University of Akron

Industrial Experience

- 1990 - Present, Consulting assignments: E.L. Robinson Engineering of Ohio, CH2M Hill, HNTB Inc., GeoSyntech Consultants, Master Builders, Tran System, Richland Engineering, Goodyear, Timmerman Geotechnical Group, Richland Engineering, BBC&M, MS Consultant, Ohio Department of Transportation, Colorado Department of Transportation, Hyundai Construction Research Institute, Shen Ye Construction Co., Ltd., DLZ Inc., Prime Engineering, Diagnostic and Integrated Applied Research, LLC, AMEC, Triggs and Associates, Summit Testing, Federal Highway Administration, National Park Service, Hyundai Construction, NASA, Jordan Valley Water Authority, Bureau of Mines, Summit County Engineers Offices, City of Cleveland Port Authorities, US Army Corp of engineers, Gannett Fleming, PPG Industries, OSI, Agra Foundation, Inc., GRL, Burgess and Niple, Ltd., J & L Laboratories, Inc., H.C. Nutting Company, AFCON, Inc., Environmental Design Group, Anthony Allega, Inc., among others.

Editorial Position

- Associate Editor, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, 2010 to present
- Editorial Board Member, Journal of Structural Safety, Journal of Underground Space, International Journal of Georisk, Journal of GeoEngineering

Recognitions and Awards

- Louis Hill Award, College of Engineering, University of Akron, 1997.
- Wendell R. Ladue Civil Engineer Award, ASCE, Akron-Canton Section, 1997.
- Outstanding Research Award, College of Engineering, University of Akron, 1999.
- National Academy TRB (Transportation Research Board) Research Committee Award for the Best Value Research Return on Deep Foundations for Sound Walls, 2000
- Outstanding Service Award, Great Lakes Geotechnical and Geoenvironmental Organization, 2004

Teaching and Research

My teaching research areas can be broadly divided into the following four broad areas: (a) Engineering mechanics, including constitutive modeling, fracture mechanics, vibration theory for nondestructive evaluation (NDE), computational algorithms, and pavement mechanics, (b) Geotechnical engineering, primarily in the area of deep foundations, slope stability, reliability based design, soil-structure interaction mechanisms, and in-situ testing, (c) High performance materials for civil infrastructures rehabilitation with an emphasis on materials properties characterization, damage and degradation mechanisms, and (d) natural and geological hazard management and mitigation techniques. The underlining theme of my research lies in developing innovative analysis, design, and management methods for constructing new or rehabilitating existing infrastructures, ensuring long-term durability of the constructed facilities, and developing better data base and data model for managing natural hazards and reducing the associated risks.

Publications

• Books and Editor of Proceedings

1. Fracture Mechanics Applied to Geotechnical Engineering, Geotechnical Special Publication No. 43, American Society of Civil Engineers, 1994, Co-Editor.
2. Mechanics of Deformation and Flow of Particulate Materials, American Society of Civil Engineers, 1997, Co-Editor.
3. Advances in Deep foundations: Design, Construction, and Quality Control, Proceedings of 12th Annual Great Lakes Geotechnical and Geoenvironmental Conference, Akron, Ohio, 2004
4. Geotechnical Engineering Circular No. 9 “Analysis, Design, and Testing of Deep Foundations for Lateral Load Applications” . Publisher, Federal Highway Administration.
5. Deep Foundations and Geotechnical In Situ Testing, ASCE Geotechnical Special Publication No. 205, Co-editor, June 2010
6. Slope Stability and Earth Retaining Walls, ASCE Geotechnical Special Publication No. 216, Co-Editor, June 2011.
7. Advances in Soil dynamics and Foundation Engineering, ASCE Geotechnical Special Publication No. 240, Co-Editor, June 2014

• Refereed Papers in Journals

1. Kiani, B., Gandomi, A. H., Sajedi, S., and Liang, R. Y. (2016) New Formulation of Compressive Strength of Preformed-Foam Cellular Concrete: An Evolutionary Approach, ASCE, Journal of Materials in Civil Engineering
2. Li, Z., Wang, X., Wang, H., and Liang, R. Y. (2016) Quantifying Stratigraphic Uncertainties by Stochastic Simulation Techniques Based On Markov Random Field, Engineering Geology, 201,106-122, <http://dx.doi.org/10.1016/j.enggeo.2015.12.017>

Joseph E. Saliba, Ph. D, P.E.

Professor, Department of Civil and Environmental Engineering and Engineering Mechanics, University of Dayton

Prior Academic Positions

- Provost, University of Dayton, July, 2008 – May, 2014
- Dean, School of Engineering, University of Dayton, January, 2004 – July, 2008
- Chair, Department of Civil and Environmental Engineering and Engineering Mechanics, University of Dayton, August, 1996 – December, 2003
- Professor, Department of Civil and Environmental Engineering and Engineering Mechanics, University of Dayton, August, 1996 – present
- Associate Professor, Department of Civil and Environmental Engineering and Engineering Mechanics, University of Dayton, August, 1989 – July, 1996
- Assistant Professor, Department of Civil and Environmental Engineering and Engineering Mechanics, University of Dayton, August, 1984 – July, 1988
- Instructor/Research Engineer, Department of Civil and Environmental Engineering and Engineering Mechanics, University of Dayton, August, 1980 – July, 1984

Education

- Harvard University, Cambridge, Massachusetts
Certificate Program, Graduate School of Education, Institute for Management and Leadership in Education, July, 2004
- University of Dayton, Dayton, Ohio
Doctor of Philosophy in Engineering, August, 1983
Dissertation: “The Numerical Stability of Implicit Integration Schemes in Non-Associate Viscoplasticity”
- University of Dayton, Dayton, Ohio
Master of Science in Civil Engineering, May, 1980
Thesis: “Flexural Analysis of Tilt-Up Wall Panels during Erection”
- University of Dayton, Dayton, Ohio
Bachelor of Science in Civil Engineering, May, 1979

Professional Affiliations

- American Society for Engineering Education (ASEE)
- American Concrete Institute (ACI)
- American Society of Civil Engineers (ASCE)
- The Masonry Society (TMS)
- American Institute of Steel Construction (AISC)
- Precast/Prestressed Concrete Institute (PCI)

Professional Registration

Professional Engineer (PE=50241), Ohio, May, 1986

AWARDS AND HONORS

- Recipient of the 2009 Lackner Award, which is given to full-time lay faculty or staff member who, over a significant period, has made a noteworthy contribution to the Catholic and Marianist character of the University of Dayton.

- Recipient of the 2004 Outstanding Professional Achievement in Education Award by the Affiliate Societies Council of Engineering and Science Foundation of Dayton.
- Selected as one of the first National Endowment for the Humanities, Humanity Fellows at UD (2001-2002).
- Recipient of 1993 Ohio Society of Professional Engineers Outstanding Engineering Educator of Ohio.

PUBLICATIONS

Contributions to Books

- J. E. Saliba, "Micromechanics of Natural Composites," in Structures, Cellular Synthesis and Assembly of Biopolymers, Results and Problems in Cell Differentiation, Vol. 19, edited by Steven T. Case, published by Springer-Verlag, 1992, ISBN 3-540-55549-8, ISBN 0-387-55549-8.
- J. E. Saliba, "Shear Walls with Openings," in Computer Methods in Structural Masonry, edited by J. Middleton & G. N. Pande, published by Books & Journals International, 1991, ISBN 1-874-14900-3.

Selected Articles in Journals and Other Publications (latest only; complete record begins 1980)

- Collett, B., and J. E. Saliba, "Comparison of Prestressed vs. Post-Tensioned Concrete Bridges," Ohio Transportation Engineering Conference, Columbus, Ohio, 2002.
- Collett, B., and J. E. Saliba, "Design Comparison of Prestressed vs. Post-Tensioned Precast Concrete Bridge Beams," Proceedings of the 48th Annual PCI Convention and the 1st Annual Concrete Bridge Conference, Nashville, Tennessee, October, 2002.
- Collett, B., and J. E. Saliba, "Post-Tensioning and Splicing of Precast/Prestressed Bridge Beams to Extend Spans," Proceedings of Smart Systems for Bridges, Structures, and Highways, SPIE's 9th Annual International Symposium on Smart Structures and Materials, San Diego, California, March, 2002.
- Saliba, J. E., and D. Tomley, "Design Optimization of High Performance Concrete AASHTO Precast Prestressed Concrete Bridge I-Beams," Proceedings of the PCI/FHWA/FIB International Symposium on High Performance Concrete, Orlando, Florida, September, 2000.
- Zoghi, M., and J. E. Saliba, "Industry Perspectives Via Seminar," Proceedings of the 1997 American Society for Engineering Education, North Central Section Conference, Dayton, Ohio, April, 1997.
- Saliba, J. E., R. Al-Akkad, and G. E. Sawaya, "Use of Finite Elements in Masonry Structures," The Masonry Society Journal, Vol. 14, No. 2, 1996.
- Saliba, J. E., S. Dhar, J. Grove, and N. S. Brar, "A Hypervelocity Model for the Forces Produced in a Thick Target by the Penetration of Projectile," Computer and Structures Journal, Vol. 61, No. 2, August, 1996.
- Saliba, J. E., "Use of Finite Element in Micromechanics of Natural Composites," Computer and Structures Journal, Vol. 61, No. 3, August, 1996.
- Saliba, J. E., S. Dhar, J. Grove, and N. S. Brar, "Prediction of Force-Time Histories in Thick Steel Plates due to Penetration by Tungsten Rods at Velocities of 1.5 to 2.5 Km/s," International Journal of Solids and Structures, Vol. 33, No. 10, April, 1996.
- Grove, D. J., N. S. Brar, R. Brockman, S. Dhar, and J. E. Saliba, "Methodology to Assess Vulnerability of Armored Targets to Ballistic Shock from Kinetic Energy Projectiles," UD-TR-94-92, Dayton, Ohio, 1994.

Elias Toubia, Ph.D., P.E.

I EDUCATION

Ph.D., Engineering, University of Dayton, 2008
M.S., Civil Engineering, University of Dayton, 2003
B.S., Civil Engineering, Lebanese University, 2000

II. APPOINTMENTS

| | | |
|-------------------------------|---------------------------|----------------|
| Associate Professor | University of Dayton, CEE | 2017/8-Present |
| Assistant Professor | University of Dayton, CEE | 2011/8-2017/7 |
| Composite Structural Engineer | Webcore Technologies, OH | 2005/5-2011/7 |
| Structural Engineer | Elie Selwan Co., Lebanon | 2000/6-2001/12 |

III. RESEARCH INTERESTS

- Innovative structural design of composite systems
- Structural materials and experimental testing
- Behavior of reinforced concrete and masonry structures
- Fiber-reinforced concrete

IV. AWARDS AND HONORS

- 2019 Summer **Fellowship** Recipient-AFRL-SFFP-US AirForce
- 2018 Summer **Fellowship** Recipient-AFRL-SFFP-US AirForce
- The Masonry Society Journal “**Outstanding Paper Award**” (2015)
- Elias Toubia and Danny Tilton, **U.S. Patent** publication number: US20150020463 A1, “Rapid Assembly of a Modular Structure”, under Contract No. N61331-10-C-0014 awarded by the U.S. Navy. related to “Advanced Composite Personnel Transport Module” (2015)
- **PhD Scholarship**, Dayton Area of Graduate Studies-DAGSI (2004-2008)

V. PUBLICATIONS

- Oluwabusi, Oludare E., and Elias A. **Toubia**. "In-Plane Shear Characterization of Composite GFRP-Foam Sandwich Panels." **Journal of Composites for Construction** 23.5 (2019): 04019034.
- Elmushyakhi, Abraham, Elias A. **Toubia**, and Alexander B. Morgan. "Post-fire failure mechanisms of seawater-accelerated weathering composites for coastal and marine structures." **Marine Structures** 63 (2019): 304-317.

- **Toubia**, Elias A., and Abraham Elmushyakhi. "Influence of core joints in sandwich composites under in-plane static and fatigue loads." *Materials & Design* 131 (2017): 102-111.
- **Toubia**, Elias A., Sadra Emami, and Donald Klosterman. "Degradation mechanisms of balsa wood and PVC foam sandwich core composites due to freeze/thaw exposure in saline solution." *Journal of Sandwich Structures & Materials* 21.3 (2019): 990-1008.
- **Toubia**, Elias A., Sadra Emami, and Donald Klosterman. "Failure mechanism of woven roving fabric/vinyl ester composites in freeze–thaw saline environment." *Journal of Composite Materials* 51.23 (2017): 3269-3280.
- **Toubia, E. A., & Emami, S.** (2016). Experimental evaluation of structural steel coating systems. *Journal of Materials in Civil Engineering*, 28(12), 04016147.
- **Toubia, E., Emami, S.,** “Performance Comparison of Structural Steel Coating Systems” (vol. **FHWA/OH-2016/8**). Ohio Department of Transportation: US Department of Transportation/ Federal Highway Administration. <http://www.ohiomemory.org/cdm/singleitem/collection/p267401ccp2/id/13585>
- Marziale, S. A., **Toubia, E.** (2015). Analysis of brick veneer on concrete masonry wall subjected to in-plane load. *Structures*, 2, 1-7. <http://www.journals.elsevier.com/structures>
- El Mir, C., **Toubia, E.,** Brockman, R. A. (2014). Analysis of cylindrical sandwich structures with weak orthotropic core under patch loading. *Engineering Structures/Elsevier*, 80(1), 89-97.
- Morgan, A. B., **Toubia, E.** (2014). Cone Calorimeter and Room Corner Fire Testing of Balsa Wood Core/Phenolic Composites Skin Sandwich Panels. *J. Fire Sciences.*, 32, 327-344.
- Lintz, J. M., **Toubia, E.** (2013). In-Plane Loading of Brick Veneer over Wood Shear Walls. *The Masonry Society*, 31(1), 15-27. (**Outstanding Paper Award**)
- Naji, B., **Toubia, E.** (2015) , Flexural Analysis and Composite Behavior of Precast Concrete Sandwich Panel. International Journal: Fib Federation International de Beton, **International Federation of Structural Concrete.** <http://www.fibcopenhagen2015.dk/>
- **Toubia, E.,** Ishtewi, A. (2015) , Pure Shear Capacity of Fiber-Reinforced Concrete. Copenhagen: Fib Federation International de Beton, **International Federation of Structural Concrete.** <http://www.fibcopenhagen2015.dk/>
- Bednarczyk, B.A., Yarrington, P, Lucking, C., Collier, C., Ainsworth, J., and **Toubia, E.** (2011) “Efficient Design and Analysis of Lightweight Reinforced Core Sandwich and PRSEUS Structures,” *Technical Report, NASA/TM—2011-217198.*
- Stoll, Frederick, & Toubia, Elias. (2011). Reducing Cost and Weight of Wind Turbine Blades Using Engineered Cores. United States. (**DOE/ER/84792-1**).

VI. PROFESSIONAL MEMBERSHIPS

- American Concrete Institute
- Precast/Prestressed Concrete Institute
- The Masonry Society
- Soc. for the Advancement of Materials and Process Eng. (SAMPE),

Hui Wang, Ph.D.

Assistant Professor, Department of Civil and Environmental Engineering and Engineering Mechanics

PROFESSIONAL PREPARATION

| | | | | |
|-------------------------|-----------------|---|-------|-----------|
| Tongji University, | Shanghai, China | Civil Engineering | B.S. | 2009 |
| Tongji University, | Shanghai, China | Geotechnical Engineering | M.S. | 2012 |
| University of Akron, | Akron, OH | Civil Engineering | Ph.D. | 2015 |
| RWTH Aachen University, | Aachen, Germany | Applied Machine Learning in Geosciences | | 2015-2018 |

APPOINTMENTS

| | |
|-----------------|--|
| 08/18 – Present | Assistant Professor, Department of Civil and Environmental Engineering and Engineering Mechanics, The University of Dayton, Dayton, OH |
| 08/15 – 08/18 | Postdoctoral Research Associate, The Aachen Institute for Advanced Study in Computational Engineering Science, RWTH Aachen University, Aachen, Germany |
| 08/12 – 08/15 | Graduate Research Assistant, Department of Civil and Environmental Engineering, University of Akron, Akron, OH |
| 09/09 – 08/12 | Graduate Research Assistant, Department of Geotechnical Engineering, Tongji University, Shanghai, China |

PUBLICATIONS

- 1) Gong, W., Tang, H., **Wang, H.**, Wang, X., & Juang, C. H. (2019). Probabilistic analysis and design of stabilizing piles in slope considering stratigraphic uncertainty. *Engineering Geology*, 259, 105162. <https://doi.org/10.1016/j.enggeo.2019.105162>
- 2) **Wang, H.**, Yajima, A., Castaneda, H. (2019). A Stochastic defect growth model for reliability assessment of corroded underground pipelines. *Process Safety and Environmental Protection*. (on-line) <https://doi.org/10.1016/j.psep.2019.01.005>
- 3) Wang, X., **Wang, H.**, Liang, R. Y., & Liu, Y. (2019). A semi-supervised clustering-based approach for stratification identification using borehole and cone penetration test data. *Engineering geology*, 248, 102-116. <https://doi.org/10.1016/j.enggeo.2018.11.014>
- 4) **Wang, H.**, Wellmann, F., Zhang, T., Schaaf, A., Kanig, R. M., Verweij, E., ... & van der Kruk, J. (2019). Pattern Extraction of Topsoil and Subsoil Heterogeneity and Soil - Crop Interaction Using Unsupervised Bayesian Machine Learning: An Application to Satellite - Derived NDVI Time Series and Electromagnetic Induction Measurements. *Journal of Geophysical Research: Biogeosciences*. <https://doi.org/10.1029/2019JG005046>
- 5) **Wang, H.**, Wang, X., Wellmann, J.F., Liang, R., (2018). A Bayesian unsupervised learning approach for identifying soil stratification using cone penetration data. *Canadian Geotechnical Journal*. <https://doi.org/10.1139/cgj-2017-0709>
- 6) Wang, X., **Wang, H.**, Liang, R., (2018). A Semi-Supervised Clustering based Approach for Stratification Identification Using Borehole and Cone Penetration Test Data. *Engineering Geology*, 248, 102-116. <https://doi.org/10.1016/j.enggeo.2018.11.014>
- 7) **Wang, H.**, Wang, X., Wellmann, J.F., Liang, R. (2017). A Bayesian stochastic soil modeling framework using Gaussian Markov random fields. *ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems*. 4(2), 04018014. <https://doi.org/10.1061/AJRUA6.0000965>

- 8) **Wang, H.**, Wellmann, J. F., Li, Z., Wang, X., & Liang, R. Y. (2016). A Segmentation Approach for Stochastic Geological Modeling Using Hidden Markov Random Fields. *Mathematical Geosciences*, 49(2), 145-177. <https://doi.org/10.1007/s11004-016-9663-9>
- 9) **Wang, H.**, Yajima, A., Liang, R. Y., & Castaneda, H. (2015). A clustering approach for assessing external corrosion in a buried pipeline based on hidden Markov random field model. *Structural Safety*, 56, 18-29. <https://doi.org/10.1016/j.strusafe.2015.05.002>
- 10) **Wang, H.**, Yajima, A., Liang, R. Y., & Castaneda, H. (2015). Reliability based temporal and spatial maintenance strategy for integrity management of corroded underground pipelines. *Structure and infrastructure engineering*, 12(10), 1281-1294. <https://doi.org/10.1080/15732479.2015.1113300>
- 11) **Wang, H.**, Yajima, A., Liang, R. Y., & Castaneda, H. (2015). A Bayesian model framework for calibrating ultrasonic in-line inspection data and estimating actual external corrosion depth in buried pipeline utilizing a clustering technique. *Structural Safety*, 54, 19-31. <https://doi.org/10.1016/j.strusafe.2015.01.003>
- 12) **Wang, H.**, Yajima, A., Liang, R. Y., & Castaneda, H. (2014). Bayesian modeling of external corrosion in underground pipelines based on the integration of Markov chain Monte Carlo techniques and clustered inspection data. *Computer-Aided Civil and Infrastructure Engineering*, 30(4), 300-316. <https://doi.org/10.1111/mice.12096>
- 13) Yajima, A., **Wang, H.**, Liang, R. Y., & Castaneda, H. (2014). A Clustering based method to evaluate Soil Corrosivity for pipeline external integrity management. *International Journal of Pressure Vessels and Piping*, 126, 37-47. <https://doi.org/10.1016/j.ijpvp.2014.12.004>

TEACHING and RESEARCH

- 1) Developed the curricular materials of a new elective graduate interdisciplinary course “CEE 595: Pattern Recognition and Machine Learning” at the University of Dayton (2019).
Introduced state-of-art Bayesian machine learning techniques including supervised regression, classification, and unsupervised clustering techniques for variety applications in engineering.
- 2) Organized module “Structural safety and Risk” for undergraduate course “EGR 201: Statics” at the University of Dayton (2018 – 2019).
Delivered basic concepts of risk, reliability and probabilistic design parameters to undergraduate students in civil engineering and mechanical engineering majors through in-class design and hands-on experiences via a structure design competition.
- 3) Served as advisor for Engineering Summer Camps for High School Students at the school of Engineering, the University of Dayton (2018).
 - *METEC – Minority Engineering & Technology Enrichment Camp for Your Man*
 - *WIE – Women in Engineering*
 - *Minority STEM Summer Bridge Program*
- 4) Developed the probabilistic prediction module for pipeline corrosion defect identification using DCVG and in-line inspection at the University of Akron (2012 – 2015).
Developed a Bayesian machine learning-based external corrosion predictive model using indirect DCVG measurements and direct in-line inspections, the developed computational tools have been tested in real-world pipeline integrity management projects and achieved positive results.
- 5) Developed the open-source python package: BaySeg (Bayesian Segmentation) for data fusion and large scale pattern extraction using geophysical and remote sensing datasets at RWTH Aachen University (2016-2018).
Lead the research activity in the development of the referred python open-source package, which is currently hosted on the open-source community GitHub: <https://github.com/cgre-aachen/bayseg>. This package is adopted by the CGRE research group at RWTH Aachen University, Germany

3. CEM PROGRAM COURSE DESCRIPTIONS

3. CEM PROGRAM COURSE DESCRIPTIONS

Proposed CEM Catalog

CEM 501 Construction Engineering, 3 Credits: Provides overview of the Architecture-Engineering-Construction (AEC) industry and its typical business relationships. The course considers options for capital project procurement that in turn lead to different contract approaches and risk allocation. Planning, estimating and scheduling tools are introduced to evaluate potential production processes and prepare competitive bids. Includes concepts and tools relating to control of project execution such as monitoring progress, as well as mitigating problems.

CEM 502 Design & Construction Project Management, 3 Credits: Fundamentals of project management as they relate to the design and construction professional, and the application of project management techniques to the design and construction of major projects. Course covers full range of project management body of knowledge areas.

CEM 503 Procurement & Contract Management for Construction Projects, 3 Credits (New): Fundamentals of procurement and contracting management as they relate to the design and construction professional. Topics include: development of procurement and contract strategy, reflecting project delivery method and choice of contract form/type; use of standard contract models such as AIA, EJCDC, Consensus Docs; review of key provisions in design and construction contracts; dealing with changes, disputes and claims.

CEM 511 Managing Field Operations, 3 Credits (New): Fundamentals of construction management efforts from pre-construction services through project close-out. First of two course covers: life-cycle of construction management efforts; planning and managing a job site; managing technical submittals and field challenges, development of construction execution strategies reflecting decisions related to approaches for and coordination among various construction disciplines (civils, steel, mechanical/HVAC, electrical) and selection of construction equipment.

CEM 512 Managing Construction Organizations, 3 Credits (New): Fundamentals of construction management efforts from pre-construction services through project close-out. Second of two course covers: planning and managing construction labor productivity, construction quality, health, safety, security and environmental topics; organizational development (including management of labor force); administering contracts; cash flow forecasting, construction accounting principles, managing information and communications; and effective reporting.

CEM 513 Executing 21st Century Project, 3 Credits (New): Advancements in traditional construction management to apply latest technology and industry trends to build projects more effectively and efficiently. Topics would include: use of BIM (building information modelling) and other visualization tools, design and construction of sustainable projects, application of CII (Construction Industry Institute) best practices and other value improving approaches, use of lean construction approaches (including pull planning).

CEM 521 Advanced Cost Estimating & Scheduling for Construction Projects, 3 Credits (New): Advanced topics in planning and scheduling for construction projects: planning techniques including use of GPM/NetPoint, development of resource-loaded CPM schedules,

review of CPM schedules, ongoing schedule management including updating and revising project schedules, and schedule delay analysis., Advanced topics in estimating of construction projects: covering conceptual, semi-detailed and further depth into detailed estimating methods. Methods for estimating direct and indirect costs are presented. Pre-requisite: CEM501

CEM 522 Performance Management for Construction Projects, 3 Credits (New): Fundamentals in performance management of cost and schedule parameters for construction projects: establishing performance baselines, advanced application of earned value analysis, cash flow forecasting, ongoing data capture and trend analysis, forecasting approaches for: project costs, construction labor productivity and completion dates. Conversion of data into effective reports for use at various management levels of a project.

CEM 523 Construction Project Risk Management, 3 Credits (New): Fundamentals of risk management for construction projects: development of risk management plan, risk identification techniques, use of risk register, qualitative risk analyses, quantitative risk analyses including Monte Carlo simulation modeling of cost estimates and project schedules; risk response and mitigation.

CEM 531 Construction Process Modeling and Simulation Analysis, 3 Credits (New): This course introduces quantitative methods for the design and analysis of construction operations to optimize construction productivity. Topics to be covered includes queuing theory, line of balance techniques, Markov Chain, linear programming and discrete event simulation.

CEM 532 Introduction to Data Analytics for Engineering Systems, 3 Credits (New): This course is designed to provide students opportunities to learn how state-of-the-art data analytics technologies can be successfully applied to various construction activities in an integrated manner, in order to improve cost, time, quality, and safety performances of projects. Advance data processing technologies, such as image processing, Wavelet transform, decision tree, clustering, and deep learning, are some of the key topics to be covered. Methodologies for identifying construction data analytics needs, evaluating its usefulness, and estimating its economic potential are also addressed.

CEM 533 Construction Automation, 3 Credits (New): This course introduces construction automation technologies to automate construction operations and construction management processes. Topics include but not limited to: construction robotics, BIM, 3D scanning, 2D vision-based monitoring, machine learning, fuzzy inference, and genetic algorithms.

CEM 541 Advanced Construction Engineering, 3 Credits (New): This course will cover engineering design principles and methods needed in the construction industry, including but not limited to: concrete formwork, scaffolding, support excavation systems, and equipment and methods for hoisting materials and erecting structures

CEM 590 Special Readings in Construction Engineering & Management, 3 Credits (New): Directed reading in a designated area arranged and approved by the student's faculty advisor and the department chair.

CEM 595 Research in Construction Engineering & Management, 3 Credits (New): Directed research in a designated area of construction engineering and management arranged and approved by the student's faculty advisor and the department chair.

CEM 598 Construction Project Execution & Strategy, 3 Credits (New): Capstone experience to simulate use of high-performance teamwork to apply construction engineering and management on a project from pre-construction through close-out. Pre-requisite: CEM 502

Courses from existing CEE Catalog

CEE 502 Pre-stressed Concrete, 3 Credits: Discussion of the properties of concrete and pre-stressed steel. Theory and design of pre-stressed concrete beams, slabs, columns, frames, ties, and circular tanks. Pre-requisite: CEE 412 or consent or equivalent

CEE 507 Masonry Design, 3 Credits: Properties and performance criteria of bricks, concrete blocks, mortar and grout, codes and construction practices, design of masonry elements, Pre-requisite: CEE 316 or consent or equivalent

CEE 508 Design Timber Structures, 3 Credits: Study of basic wood properties and design consideration. Design and behavior of wood connectors, fasteners, beams, columns, and beam columns. Introduction to plywood and glued laminated members, analysis and design of structural diaphragms and shear walls. Prerequisite: CEE 316 or consent or equivalent

CEE 515 Pavement Engineering, 3 Credits: Fundamental principles of flexible and rigid highway and airport pavement design, construction, and management, Prerequisite: CEE 403 or consent or equivalent

CEE 522 Subsurface Investigation, 3 Credits: Soil & rock classification, geophysical methods, subsurface explorations, soil sampling, van shear, standard penetration, cone penetration, pressure meter, dilatometer, and plate load testing, in-situ measurements, field instrumentation, Prerequisite: CEE 312 or equivalent

CEE 524 Foundation Engineering, 3 Credits: Review of soil properties, site exploration and evaluation, bearing capacity, settlements, shallow foundations, retaining structures, and deep foundations.

CEE 525 Soil Improvement, 3 Credits: Principles of various mechanisms and technologies for improving soils in situ, design consideration and construction process, performance specifications, quantity and cost estimate, sustainability consideration, quality assurance and acceptance criteria, decision making and construction optimization, case studies

CEE 526 Retaining Structures & Slopes, 3 Credits: Earth pressure theories; design of earth retaining structures, such as rigid walls, anchored sheet pile walls, and reinforced soil structures; stability of excavation, cut, and natural slopes; slope stabilization methods.

CEE 572 Bayesian Machine Learning and Engineering Application, 3 Credits: The goal of this course is to provide a broad introduction to the key ideas and concepts in Bayesian machine learning and uncertainty quantification and their applications in recent engineering research and design practices. It is aimed at advanced undergraduates or graduate students. The emphasis will be on some selected intuition and practical examples rather than heavy theoretical results, though some experience with probability, statistics, and linear algebra will be important. Through a variety of lecture examples, students will learn how to apply uncertainty quantification techniques to get confidence interval of the predictions from a machine learning model and how to use the results as a critical basis for the following decision making.

4. FISCAL IMPACT STATEMENT

4. FISCAL IMPACT STATEMENT

A. Budget for New Graduate Degree Programs

| | FY21 Year 1 | FY22 Year 2 | FY23 Year 3 | FY24 Year 4 |
|---|----------------|----------------|----------------|----------------|
| Projected Enrollment | | | | |
| Head-count full time | 8 | 16 | 24 | 30 |
| Head-count part time | 2 | 4 | 4 | 4 |
| Full Time Equivalent (FTE) enrollment | 9 | 18 | 26 | 32 |
| | | | | |
| Projected Program Income | | | | |
| Tuition | \$264,000 | \$542,000 | \$802,000 | \$1,012,000 |
| Externally funded stipends, as applicable | 0 | 0 | 0 | 0 |
| Expected state subsidy | 0 | 0 | 0 | 0 |
| Other income | 0 | \$5,000 | \$5,000 | \$5,000 |
| | | | | |
| TOTAL PROJECTED PROGRAM INCOME: | \$264,000 | \$547,000 | \$807,000 | \$1,017,000 |
| | | | | |
| Program Expenses | | | | |
| New Personnel | | | | |
| • Faculty | | | | |
| Full <u>FY21: 1; FY24: 1</u> | | | | |
| Part Time <u>3</u> | \$185,000 | \$189,000 | \$194,000 | \$341,000 |
| • Non-instruction | | | | |
| Full _____ | | | | |
| Part time _____ | | | | |
| New facilities/building/space renovation | 0 | 0 | 0 | 0 |
| Tuition Scholarship Support | 0 | 0 | 0 | 0 |
| Stipend Support | 0 | 0 | 0 | 0 |
| Additional library resources | 0 | 0 | 0 | 0 |
| Additional technology or equipment needs | \$20,000 | \$20,000 | \$20,000 | \$40,000 |
| Other expenses | \$20,000 | \$20,000 | \$20,000 | \$20,000 |
| | | | | |
| TOTAL PROJECTED EXPENSE: | \$225,000 | \$229,000 | \$234,000 | \$401,000 |
| | | | | |
| NET | \$39,000 | \$318,000 | \$573,000 | \$616,000 |

Budget Narrative:

- Enrollment – Total students enrolled each year
- Tuition – Gross student tuition
- Other Income – VR facility industry usage
- New Personnel Faculty – FY21: Program Director; FY24: Assistant Professor
- Additional technology or equipment needs – Software and maintenance for labs
- Other expenses – Marketing and travel

5. MARKET ANALYSIS AND/OR NEEDS SURVEY

5. MARKET ANALYSIS AND/OR NEEDS SURVEY

Evidence of a Market Exists for the New Program

The Market: According to the data presented in Statista¹, the construction industry is a mainstay of U.S. economy. Values added as a percentage of U.S. GDP has grown from 3.4 percent in 2009 to 4.1 percent in 2019. Construction spending has grown from \$800 billion in 2010 to almost \$1,300 billion in 2018. The outlook for construction spending has been projected to grow from \$1,400 billion in 2019 to \$1,500 Billion in 2022. The strong domestic demand for well-trained students with a master's degree in construction engineering and management is reported in the U.S. Bureau of Labor Statistics. Employment of construction managers is projected to grow 11 percent from 2016 to 2026, faster than the average for all occupations. Construction managers are expected to be needed to oversee the anticipated increase in construction activity over the coming decade. The rapid globalization of the world's construction engineering and management market, advancement of technological innovation in information management (e.g., Building Information Modeling), the great demand for experts in big data analytics, construction automation, and changing regulatory environments, have provided unprecedented opportunity for graduates with a construction engineering and management degree beyond the bachelor's level.

Increasing Popularity of Specialized Master's Degree Programs: Master's in the Construction Engineering and Management program prepares students for careers in construction, engineering, and project management. Candidates with a graduate degree in construction management qualify for senior positions in the construction industry. The construction engineering and management master's degrees produce construction managers with advanced project management and leadership skills specific to the field. Development projects increasingly demand construction managers with experience in large-scale management and construction technology. The Bureau of Labor Statistics (BLS) projects an 11% increase in job growth for construction managers through 2026. Construction managers with graduate degrees can choose from many positions, including private, commercial, and government project management. Managers specializing in construction can earn an average annual salary of more than \$91,000, with top earners in heavy and civil engineering construction and nonresidential building. The letters of support from construction companies can be found in **Appendix**.

Strong Demand from the International Communities: The globalization of the world's construction market creates strong demand for professionals with practical knowledge in construction engineering and management; such demand is particularly strong in emerging markets such as countries in the Middle East and Asia. Traditionally, the UD's CEE department has attracted a large number of students from foreign countries, such as the United Arab Emirates, Saudi Arabia, Kuwait, China, and India. We will continue to cultivate these existing reputations and broadening our recruiting efforts to form a student body with diverse internationals.

¹ Statista (2019) "U.S. Construction Industry - Statistics & Facts"
<https://www.statista.com/topics/974/construction/> (Accessed: Dec. 17th, 2019)

6. LETTERS OF SUPPORT

- A. Letter from Industry**
- B. Letter from Industrial Advisory Board**
- C. Letter from Provost**
- D. Letter from Engineering Dean**
- E. Letter from Associate Dean for Research & Innovation**
- F. Letter from Civil Engineering Department Chair**

6. LETTERS OF SUPPORT

A. Letter from Industry



400 Canal Street, P.O. Box 726
Sidney, OH 45365-0726
Phone: 937-498-2381
Fax: 937-498-2243

December 12, 2019

Department of Civil and Environmental Engineering
and Engineering Mechanics
School of Engineering
University of Dayton
300 College Park
Dayton, OH 45469

To whom it may concern:

I am writing this letter to recommend a Master of Construction Engineering and Management degree program at the University of Dayton's civil engineering department. As an executive in the construction industry, as well as a member of the industry advisory board for the Department of Civil and Environmental Engineering and Engineering Mechanics, I am in full support of such a master's degree.

I have reviewed University of Dayton's proposal for the master's degree in construction engineering and management and found it to be very comprehensive responsive to the current industry needs. The curriculum provides balanced training in traditional principles of construction engineering and management with state-of-art techniques (e.g., construction process modeling, building Information modeling and advanced analytics of construction data) to create efficiency and better control during construction.

As our industry has evolved rapidly to meet the challenges of ever increasing complexities of project scope, we need to prepare our young professionals with adequate knowledge and skill beyond traditional 4-year bachelor degree training. A construction engineering and management program master's degree at UD would certainly help our young professionals gain advanced training to handle the complexities of modern construction projects and/or construction organizations.

I am very excited for the future of our industry and look forward to the establishment of the master's degree in construction engineering and management at University of Dayton.

If you have any questions, please feel free to contact me via e-mail at doug@ferguson-construction.com or by phone (937) 498-2381.

Sincerely,

FERGUSON CONSTRUCTION COMPANY

A handwritten signature in black ink, appearing to read 'Doug L. Fortkamp', written over a horizontal line.

Douglas L. Fortkamp
President

Sidney • Dayton • Columbus, OH • Columbus, IN
www.ferguson-construction.com
An Equal Opportunity Employer

B. Letter from Industrial Advisory Board



University of Dayton
**School of
Engineering**

December 13, 2019

Department of Civil and Environmental Engineering
and Engineering Mechanics
School of Engineering
University of Dayton
Dayton OH 45469

To whom it may concern:

I am writing this letter to recommend a Master of Construction Engineering and Management degree program at the University of Dayton's civil engineering department. With extensive experiences as an executive in the construction industry and currently serving as the Chairmen of the industry advisory board for the Department of Civil and Environmental Engineering and Engineering Mechanics, I am in full support of such a master's degree.

As our industry continues to evolve and adapt at the ever-changing challenges, we need to prepare students at the highest level. Modern construction projects present a variety of challenges in terms of harmonizing relationship among various parties, meeting quality, cost and schedule goals, and being a good "corporate citizen" in terms of maintaining health, safety and environmental standards. These challenges create the need for construction engineering and management as a specialized discipline. A Construction Engineering and Management master's degree would allow students to develop technical competency and leadership skills to carry out complex activities in the industry.

I am excited for the future of our industry and the prospect of having highly educated young professionals entering into the work force to lead its growth.

If you have any questions, please feel free to contact me via. E-mail at vcorrado@shookconstruction.com or on my personal cell phone (937) 478-8067.

Sincerely,

Vince Corrado
CEO Emeritus, Shook Construction
Chairmen, Industry Advisory Board for Civil Engineering Dept.

**DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
AND ENGINEERING MECHANICS**

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Kettering Labs 422 • 300 College Park • Dayton, Ohio 45469-0243
937-229-3847

udayton.edu/engineering/departments/civil

C. Letter from Provost



University of Dayton

February 7, 2020

To whom it may concern:

The University of Dayton (UD) supports the establishment of the proposed master's degree in construction engineering and management. The Department of Civil and Environmental Engineering and Engineering Mechanics (Department) will host the degree program and provide the requisite academic oversight of its operations. The university believes professional master's degree programs make a valuable contribution to the greater community. This proposed degree program will directly support enhanced construction activity and promote further economic development in the region. Both are consistent with UD's strategic commitment to *advance the common good*.

We anticipate that program graduates will be in strong demand by construction firms in Ohio and the region. We also believe that student demand will be high when we launch this new degree option. The typical student will be a baccalaureate engineering graduate or graduate from a closely related discipline in the built environment. The program curriculum is designed to add management skills and advanced construction engineering capabilities to this undergraduate foundation. This combination should be especially attractive to prospective employers.

One of my key responsibilities is to assure that appropriate resources are available to offer a high-quality academic program. The faculty are clearly the most critical of these resources. The School of Engineering has confirmed that the quantity, quality, and expertise of faculty necessary to support this program are already in place. Two recent hires in the Department provide important and necessary capabilities in this field and will allow launching the program as soon as it is formally approved. Other resources such as laboratories and student support services are planned or are already in place. We are confident that no additional resources are required to deliver this degree program. My office will monitor early progress through steady-state operations to ensure that academic expectations are fully met.

The proposed master's degree in construction engineering and management will be a welcome addition to our campus and community. On behalf of the University of Dayton, I encourage the approval of this valuable new program.

Sincerely,

Paul Benson, Ph.D.
Provost and Executive Vice President of Academic Affairs

c: Eddy Rojas, Ph.D., Dean, School of Engineering

Office of the Provost • 300 College Park, Dayton, OH 45469-1634 •
937-229-2245 (phone) • 937-229-3400 (fax)
provostoffice@udayton.edu • www.udayton.edu

D. Letter from Engineering Dean



University of Dayton
**School of
Engineering**

January 10, 2020

To Whom It May Concern:

I offer my strong support for the proposed master's degree in construction engineering and management. As a new graduate degree option it offers an additional professional pathway for individuals with a strong interest in an architecture-engineering-construction (AEC) career. Construction is a vital component of the regional and state economies, and this new degree program is ideally suited to support it.

The School of Engineering at the University of Dayton has strategically focused on developing graduate programs that not only address the changing demands of our region but also promote *engineering that matters*. Our university's vision of *advancing the common good* is well-served by such professionally-oriented programs as this construction engineering and management master's degree. We believe there will be a strong student demand from the outset. We are also confident that medium-to-large AEC firms in Ohio and beyond will enthusiastically recruit these graduates.

We already have the faculty resources in place to offer the proposed degree program. We supplemented the existing geotechnical, structures, and transportation strengths in our civil and environmental engineering department by adding two recent hires with special proficiency in construction. We now have high-level expertise in BIM (building information modeling), project risk management, construction project delivery strategies, and construction field operations. With a total of 14 full-time faculty members in the civil and environmental engineering department, we believe that our faculty is fully qualified to offer this new master's degree program. Our soon-to-be-renovated laboratory space in Kettering Labs will house state-of-the-art computational, modeling, and visualization equipment to support the new program. Access to advanced technologies such as BIM and augmented-reality/virtual-reality combined with a comprehensive, modern curriculum will prepare our graduates to be future leaders in the industry. We thus already have all the resources in place or in progress to offer an exceptional program in construction engineering and management.

The time is right to deploy this new graduate degree in construction engineering and management. It will provide an exciting career path for our future students while addressing compelling professional needs in an industry vital to state and regional economic growth. I unreservedly urge the adoption of this proposed, new professional master's degree program.

Sincerely,



Eddy M Rojas, Ph.D., P.E., NAC
Dean

**SCHOOL OF ENGINEERING
OFFICE OF THE DEAN**

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Kettering Labs • 300 College Park • Dayton, Ohio 45469-0254
937-229-2736 • 937-229-2756 Fax

E. Letter from Associate Dean for Research & Innovation



University of Dayton
**School of
Engineering**

January 16, 2020

University of Dayton
Civil Engineering Department
300 College Park
Dayton, OH 45469

Re: Letter of Support for new Master's in Construction Engineering and Management

To Whom it May Concern:

The School of Engineering's Graduate Studies Committee is wholeheartedly in support of the new Master's in Construction Engineering and Management program that the department of Civil Engineering is proposing. We look forward to partnering with them on this endeavor.

Recognizing that our programs and curricula must respond to the evolving needs of society in a manner that is nimble, cross-disciplinary in nature and encourages lifelong learning is paramount to our mission as a Catholic, Marianist institution of higher education. We encourage any program that will further the mission of our university; further the growth of our students and improve our societal impact within our community, nation and the world.

Sincerely,

A handwritten signature in black ink, appearing to read 'R. Wilkens'.

Robert J. Wilkens, Ph.D., P.E.
Associate Dean for Research and Innovation,
Professor, School of Engineering

**SCHOOL OF ENGINEERING
DEAN'S OFFICE**

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937-229-2736 • 937-229-2756 Fax

udayton.edu/engineering

F. Letter from Civil Engineering Department Chair



University of Dayton
**School of
Engineering**

January 9, 2020


To Whom It May Concern:

The purpose of this letter is to indicate strong civil engineering department's support to the proposed new master's degree in construction engineering and management.

Over the past year, through faculty's initiatives coupled with local construction industry's advocacy (see the attached supporting letter from the local construction company), the civil engineering department began the planning of a master's degree program in construction engineering and management. The curriculum of the proposed master's program was developed by a planning committee consisting of three faculty members in the civil engineering department and an external consultant, Dr. David Ashley (a member of National Academy of Construction with extended teaching, research, and consulting experiences in the construction engineering and management area). The curriculum was reviewed and approved by the department faculty. In addition, the department's industry advisory committee reviewed and endorsed the proposed curriculum (see the attached supporting letter from the Chair of the Civil Engineering Industry Advisory Committee). Finally, the School of Engineering Graduate Studies Committee formally approved the proposed master's degree and its curriculum. Letters of support from Dean of Engineering and Provost are also attached.

We look forward to receiving an approval for the program's launch. Our department is committed to its successful launch and continuing success.

Sincerely,



Robert Liang, Ph.D., P.E.
Professor and Department Chair of Civil Engineering

**DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
AND ENGINEERING MECHANICS**

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