

BOARD OF HIGHER EDUCATION
REQUEST FOR COMMITTEE AND BOARD ACTION

COMMITTEE: Academic Affairs

NO.: AAC 14-40

COMMITTEE DATE: April 29, 2014

BOARD DATE: May 6, 2014

**APPLICATION OF WENTWORTH INSTITUTE OF TECHNOLOGY TO AWARD THE
MASTER OF ENGINEERING IN CIVIL ENGINEERING**

MOVED: The Board hereby approves the Articles of Amendment of **Wentworth Institute of Technology** to offer the **Master of Engineering in Civil Engineering**.

Authority: Massachusetts General Laws Chapter 69, Section 30 et seq.

Contact: Shelley Tinkham, Ph.D., Assistant Commissioner for Academic, P-16
and Veterans Policy

BOARD OF HIGHER EDUCATION

May 2014

Wentworth Institute of Technology Master of Engineering in Civil Engineering

INTENT

Wentworth Institute of Technology, a New England Association of Schools and Colleges accredited, independent institution located in Boston, Massachusetts, filed articles of amendment to offer a Master of Engineering in Civil Engineering (MEng CE). The Master of Engineering in Civil Engineering program is designed to provide students with the knowledge, skills, and attitudes to address challenges and opportunities as future civil engineers. The curriculum will provide graduates with the tools and body of knowledge to maintain and manage the built environment.

According to the American Society of Civil Engineers (ASCE) a bachelor's degree in civil engineering is no longer sufficient for the practice of civil engineering at the professional level. Additionally, the U.S Bureau of Labor Statistics (BLS) reports that civil engineers are expected to have employment growth of 24 percent nationally from 2008 to 2018, which represents almost 40% of the total projected employment growth for all engineering disciplines combined. Wentworth's proposed program plans to enroll not only seasoned professionals in civil engineering but is also well positioned to directly recruit recent graduates from their Bachelor of Science degrees in Civil Engineering, Civil Engineering and Technology, and Facility Planning and Management; all of which prepare students for the opportunity to pursue the proposed MEngCE.

The institution is planning to seek accreditation for the proposed program and its Bachelor of Civil Engineering degree from the Accreditation Board for Engineering and Technology (ABET) in June 2014. In order for individuals to become licensed civil engineers they must earn a degree from an ABET accredited engineering program.

The program was submitted after meeting internal campus requirements for approval including a vote by the Board of Trustees on May 14, 2011.

INSTITUTIONAL OVERVIEW

Wentworth Institute of Technology, located in Boston, Massachusetts, is a private coeducational institution of higher education offering bachelor's degrees in twenty-four majors, including architecture, interior and industrial design, computer science, engineering, engineering technology, and management. The Institute was founded in 1904 through a bequest from Arioeh Wentworth, a Boston merchant.

In 1956, the Commonwealth of Massachusetts granted Wentworth Institute the power to award the Associate in Engineering; the Associate in Applied Science in 1968; and the Bachelor of Science and Bachelor of Engineering Technology in 1970. In 1977, Wentworth Institute and Wentworth College were merged into Wentworth Institute of Technology with the surviving corporation authorized to offer the Bachelor of Science in Engineering Technology, Bachelor of Engineering Technology, Associate in Engineering and Applied Science, and appropriate honorary degrees. In 1984 the Institute was empowered to "grant degrees at the associate and baccalaureate level in fields of science, engineering and technology" and to "confer appropriate

honorary doctorate and ex officio degrees.” The Board of Higher Education approved the Master of Architecture in 2008, the Master of Science in Construction Management in 2010 and the Master of Science in Facility Management in 2012.

The institution now requests the authority to offer the Master of Engineering in Civil Engineering.

ACADEMIC AND RELATED MATTERS

Admission

The target population is working professionals with undergraduate degrees in civil engineering, engineering technology, facility planning and management, and others that are deemed appropriate by the MEngCE Program Director and the Director of Graduate Programs.

Successful candidates for the proposed MEngCE program will meet the following criteria:

1. An undergraduate degree in civil engineering or closely related field with a minimum GPA of 3.0.
2. Official transcripts from all institutions attended after high school graduation.
3. Two letters of recommendations from current or past supervisors.
4. Results of the GRE or GMAT exams may be submitted but are not required.

Applicants will accepted to the proposed MEng CE program on a rolling basis.

Projected Enrollment

	# of Students Year 1	# of Students Year 2	# of Students Year 3	# of Students Year 4*
New Full Time	15	18	18	20
Continuing Full Time		12	15	15
New Part Time			15	15
Continuing Part Time				12
Totals	15	30	48	62

Tuition and Fees

For full time students, annual tuition will be \$25,900. For students registered for less than 12 credit hours per semester the tuition is \$715 per credit hour.

Curriculum (Attachment A)

The program will be comprised of 10 required courses totaling 30 credit hours and will be taught over three semesters in an academic year. Wentworth has three semesters per academic calendar. Students are expected to complete two courses each semester and may complete

the program in 5 semesters, or less than two years of part time study. Students from the Bachelor of Science in Civil Engineering degree can also take part in a proposed 4+1 program, which will allow undergraduates to take two graduate courses (6 credits) their senior year and complete the graduate program, once matriculated, with an additional 24 credits (8 courses) that may be completed in one year.

In Massachusetts an individual seeking to become a licensed Civil Engineer must pass the Professional Engineering (PE) exam. The PE exam tests a person's ability to practice competently in a particular engineering discipline. The curriculum for the proposed program has been organized into two areas of specialization: Construction and Infrastructure, both of which are featured on the PE exam.

Students will take a minimum of three core courses that are common to both specialty tracks, four courses in their area of specialization, a capstone course and up to two other relevant graduate courses. Core courses will focus on project management principles and practices, engineering modeling and analysis methods and environmental systems. The construction specialty track will focus on topics specified in the Civil-Construction Professional Engineer (PE) exam including estimating and scheduling, construction operations, and relevant geotechnical, structural and environmental aspects of construction.

The infrastructure track emphasizes transportation and public works infrastructure projects and includes topics also found on the PE exam including advanced transportation, structural, geotechnical and environmental coursework. The capstone will provide students with the opportunity to develop and complete an independent project in his/her area of specialty that will incorporate the knowledge, tools and techniques developed in the proposed program.

The academic quality assessment plan for the proposed program will engage all of its various constituencies (i.e. students, alumni, faculty, administrators, employers, and industrial advisors) in a cyclical assessment procedure that will use quantitative and qualitative data gathered from a variety of sources on a regular basis to affect change and improvement in the program as needed. It is also important to note that the Institute plans on offering the proposed MEng CE program entirely online after year three.

RESOURCES AND BUDGET

Faculty and Staff

The faculty for the proposed MEngCE program will build on the strength of the existing Bachelor of Science in Civil Engineering program who hold appropriate terminal degrees. The department has existing faculty that will support the start up of the MEngCE program, including eight full-time faculty and 6 adjunct faculty per semester. Three additional full-time faculty positions (one in structural and two in transportation) have been advertised with expected start dates in fall 2014.

The proposed MEngCE is a collaborative undertaking between the Department of Civil Engineering and Technology, which will provide faculty and have full academic oversight of the program, and the College of Professional and Continuing Education (CPCE) which will provide administrative support. The program will also be subject to Institute-wide policies on graduate programs established by the Institute's Graduate Programs Committee. The Director will report to the Dean of CPCE on matters relating to the curriculum, faculty selection and the academic integrity of the proposed MEngCE program.

Facilities and Library and Information Technologies

The Alumni Library supports the teaching, learning, research, professional, and cultural needs of the students, faculty, and staff of Wentworth Institute of Technology by its selection, organization, and access to information in several media. The Library is housed on two levels in Beatty Hall, which is located in the center of the campus and is open seven days a week, 96 hours per week (longer during finals). The Library has a print collection of about 71,911 volumes and almost 400 paper periodical titles. Within the 70,600 volumes are the 5,057 volumes that comprise the Civil Engineering collection.

The Library's electronic collection continues to increase in number and quality. All but one or two of the Library's electronic resources (databases, 60,860 e-books, 42,594 full-text electronic journals, and e-reference tools) are available for remote access. There are 38 print journal titles in Civil Engineering and Building Construction and 1,687 Civil Engineering online journals and databases.

A secure wireless network is available everywhere on campus as well as in the dorms. There are currently two labs available in Beatty Hall for student use with open lab hours in the evenings and afternoons. Weekend hours are also available subject to student monitors' schedules. Software programs include CAD, word processing, graphics, spreadsheet and desktop publishing. Additional equipment includes scanners, VCR's, computer projection systems, and printers.

Fiscal (Attachment B)

Wentworth projects that the program would generate a modest margin of \$18K in the first year, and turn an operating margin of 44% or \$246K in year 2. The out years (years 3-4) would average operating margins of 51% on annual revenues that would average \$1 million per fiscal year.

EXTERNAL REVIEW AND INSTITUTIONAL RESPONSE

The proposed program was reviewed January 31 – February 1, 2014 by a visiting committee comprised of faculty members David Pines, Associate Professor, Department of Civil, Environmental, and Biomedical Engineering Program, University of Hartford; Alice Alipour, Assistant Professor, Department of Civil and Environmental Engineering, University of Massachusetts-Amherst; and John Collura, Professor, Department of Civil and Environmental Engineering, University of Massachusetts-Amherst. The institution is planning to seek accreditation for the proposed program and its Bachelor of Civil Engineering program from the Accreditation Board for Engineering and Technology (ABET) in June 2014.

The review committee expressed their support of the Institute's plan to apply for ABET accreditation for both the bachelor and master degrees in Civil Engineering and also gave some suggestions for improvement. Given that the program will be offered through the College of Professional and Continuing Education (CPCE) but academically housed within the Department of Civil Engineering and Technology (CET), the committee requested clarification of roles, responsibilities and lines of communication between CPCE and CET and additionally, asked for clarification on which department students would contact if they had specific questions related to degree requirements, transfer credits, electives and career advancement. The committee also asked for a clarification on the criteria for selecting adjunct faculty as well as how faculty input plays a part in the hiring process. The review committee expressed concern over the design of the capstone course and its benefit for students who may have extensive professional

experience in civil engineering. The team also made a recommendation that pre-requisite courses for the MEngCE should be clarified in the program description and in future advertisements to help students outside of the Bachelor of Science in Civil Engineering (BSCE) become familiar with program entrance requirements.

The institution confirmed that it would be seeking ABET accreditation in June 2014.

The College provided documentation that shows a clear delineation of roles and responsibilities regarding the administration of the program and it was noted that CPCE staff are responsible for handling students concerns and questions.

The institution responded to the committees concerns regarding adjunct faculty with the following responses:

- Adjunct faculty are recommended by the MEngCE Program Director and final approval is granted by the Graduate Programs Committee (GPC).
- Adjunct faculty must, at minimum, hold a Master's degree in a relevant discipline as well as any of the following: past teaching evaluations, peer reviewed research, professional practice, leadership and active participation in professional organizations.
- The MEngCE Program Director seeks input from full-time faculty from the College of Engineering and Technology for the identification and approval of qualified adjunct instructors before forwarding the nomination to the GPC.

The institution clarified that the capstone course will cater to all graduate students by placing an emphasis on an applied research project that will demonstrate the students' command of the MEngCE curriculum. All applicants that hold bachelor's degrees outside the Bachelor of Science in Civil Engineering program must complete the following in order to be considered for the MEngCE program: pass coursework in Differential Equations and Calculus III, pass the Fundamentals of Engineering Exam (or receive a grade of B or better in a Civil Engineering certificate course offered by CPCE or have a minimum of five years of civil engineering work experience), and have a 3.3 undergraduate GPA. Those under a 3.3 will be considered on a case by case basis.

The committee expressed that the institution's response was adequate and addressed all of the recommendations.

PUBLIC HEARING

The required public hearing was held on April 24, 2014 at the Department of Higher Education, located at One Ashburton Place in Boston, Massachusetts. No comment was offered in opposition to the proposed program.

STAFF ANALYSIS AND RECOMMENDATION

The staff has thoroughly evaluated all materials submitted by Wentworth Institute of Technology and finds that the proposal meets the requirements for NEASC-accredited institutions outlined in 610 CMR 2.08. Recommendation is for approval of the school's petition to offer the Master of Engineering in Civil Engineering.

ATTACHMENT A: CURRICULUM

Graduate Program Curriculum Outline

Course Number	Course Title	Credit Hours
Core Courses		
CIVE800	Project Management Principles and Practices	3
CIVE810	Engineering Modeling and Analysis	3
CIVE820	Environmental Systems	3
CIVE895	Capstone	3
Construction Courses		
CIVE825	Engineering Estimating and Scheduling	3
CIVE835	Construction Operations, Methods and Quality Control	3
CIVE845	Temporary Structures	3
CIVE855	Site Planning and Development	3
Infrastructure Courses		
CIVE830	Traffic Analysis and Safety	3
CIVE840	Highway Design and Urban Planning	3
CIVE850	Advanced Geotechnical Engineering	3
CIVE860	Advanced Concrete and Steel Design	3
CIVE870	Bridge Design	3
CIVE880	Infrastructure Renewal	3
Curriculum Summary		
Total number of courses required for the degree		10
Total credit hours		30
<p>Prerequisite, Concentration, Dissertation or Other Requirements: Students in the Construction track must take 3 Core courses, the Capstone course, the 4 Construction courses and 2 other courses to meet the 30 credit hour requirement. Students from the Infrastructure track must take 3 Core courses, the Capstone course, a minimum of 4 of the 6 Infrastructure courses and 2 other courses to meet the 30 credit hour requirement.</p>		

ATTACHMENT B: BUDGET

M. Eng.-Civil Program								
Pro-Forma Income Statement for FY 15-FY 19								
Forecast in thousands of \$ (part time and online formats)								
	FY15	FY16	FY17	FY18	FY 19	5 Yr. Total	% of Total	
Projected Revenues	252	555	900	1206	1358	4271		
Operating Costs								
Course delivery --faculty	40	82	127	166	180	595	13.9%	
Industry experts/guest lecturers	10	20	30	40	40	140	3.3%	
Courseware dev./upgrade	24	6		6	6	42	9.8%	
Marketing/advertising	19	42	114	183	213	571	13.4%	
Staff costs	100	102	104	106	108	520	12.2%	
Fringe allocation	35	44	54	62	65	260	6.1%	
Other costs	6	14	23	30	34	107	2.5%	
Total Estimated Costs	234	309	452	593	647	2235	61.2%	
Operating Margin	18	246	448	613	711	2036		
Operating Margin % of Revenues	7%	44%	50%	51%	52%	48%		