

Center for Computational Engineering

Computational engineering plays an increasingly important role in economic competitiveness, national security, environmental stewardship, and public safety. Indeed, computational engineering is central to all engineering endeavors, from the development of appropriate mathematical models to the prediction of mechanical, electrical, chemical, and biological phenomena and the design of complex natural and engineered systems. Computational engineering has now reached the stage in which further progress—to reach full potential as a pervasive enabling technology—requires the development of new interdisciplinary education and research models.

In fall 2008, the [Center for Computational Engineering \(CCE\)](#) was formed in the School of Engineering to support computational engineering research and education at MIT. Seventy-four faculty and researchers representing 13 academic programs from across the School of Engineering, the School of Science, and the MIT Sloan School of Management are currently affiliated with CCE. We focus on computational approaches to engineering problems: formulation and implementation of new approaches that are more efficient and capable and informed application of existing approaches to important engineering and scientific questions. Our emphasis is on the development of the “next generation” of innovators and innovations in computational engineering.

Graduate Education

CCE offers two educational programs, the interdisciplinary [Master of Science Program in Computation for Design and Optimization \(CDO\)](#) and the [Doctoral Program in Computational Science and Engineering \(CSE\)](#). Nicolas Hadjiconstantinou and Youssef Marzouk serve as co-directors of the graduate programs.

Computation for Design and Optimization

CDO enrollment at the start of AY2017 was 16 students, four of whom were first-year students. Four CDO students were on the September 2016 degree list, one graduated in February 2017, and six graduated in June 2017, increasing the total number of CDO alumni to 161 as of June 2017.

CDO conducted its 13th admissions cycle this past winter and spring. Serving on the admissions committee were Youssef Marzouk (chair), Luca Daniel, Carolina Osorio, and Themistoklis Sapsis. Ninety-seven applications were submitted in January 2017, a 14% increase from the previous application period. Of the 97 applicants, nine were offered admission, and seven accepted and plan to begin pursuing their SM degree in September 2017. These seven students will be joined by one incoming student who deferred September 2016 admission and one CSE student needing to complete a master’s before formally moving into the PhD program.

Computational Science and Engineering

We began accepting applications for the Doctoral Program in Computational Science and Engineering in September 2013. CSE enrollment at the start of AY2017 was 35

students; eight were first-year students, and an additional six current doctoral students in affiliated departments joined the CSE program over the course of the academic year. Five CSE students graduated in February 2017 and one graduated in June 2017, bringing the number of CSE alumni to 14.

In fall 2016, the Department of Mathematics joined the CSE program as a home department and will award degrees in conjunction with CSE under the thesis field “mathematics and computational science.”

CSE conducted its fourth admissions cycle this past winter and spring, receiving 108 applications, a 104% increase from the previous year’s 53 applications. As CCE reviewers, Youssef Marzouk, Saurabh Amin, and Laurent Demanet read all applications and passed the names of the most qualified applicants along to the indicated home department for review. Of the 109 applicants, 11 were offered admission; one student accepted and enrolled in February 2017, one accepted and enrolled in June 2017, five accepted and plan to begin their degree work in September 2017, and one deferred admission to September 2018.

Admissions Breakdown

Course	Applications Received	Admitted	Attending
Course 1	15	3	1
Course 2	16	4	3*
Course 10	9	0	—
Course 16	18	3	2
Course 18	41	0	—
Course 22	9	1	1

*One admitted student deferred enrollment to September 2018.

Graduate Student Honors and Recognition

CSE student Pablo Fernandez del Campo was awarded second prize in the 2017 American Institute of Aeronautics and Astronautics Computational Fluid Dynamics Student Paper Competition.

CSE student Ricardo Miguel Baptista was awarded a Natural Sciences and Engineering Research Council of Canada Postgraduate Scholarship. This annual award, which is renewable for three years, is part of a program that provides financial support to high-caliber students who are engaged in doctoral programs in the natural sciences or engineering.

CSE student Abdullah Almaatouq received scholarship achievement awards from the Arabian Cultural Mission for graduate-level academic excellence. Also, he was presented with a Russell Sage Foundation travel and participation grant to attend the Summer Institute in Computational Social Science at Princeton University. Finally, he received

\$2,500 from the Russell Sage Foundation in support of a pilot experiment on the Amazon Mechanical Turk.

CSE student Mustafa Mohamad was presented with a SNAME Travel Award of \$1,500 by the Department of Mechanical Engineering.

CSE student Deepak Subramani won the 2016–2017 Wunsch Foundation Silent Hoist and Crane Award for Outstanding Graduate Research from the Department of Mechanical Engineering and the Best Live Demonstration Award at the 2016 MIT Mechanical Engineering Research Exhibition. Also, he was the graduate science first-place winner at the MIT Mechanical Engineering de Florez Award competition in May 2017 for outstanding ingenuity and creativity in a design project; he was recognized for his project “Probabilistic Regional Ocean Predictions and Optimal Path Planning.” Finally, he received an outstanding presentation award at the 2017 Tata Fellows pro-seminar.

Anthony T. Patera, Co-Director
Ford Professor of Engineering
Professor of Mechanical Engineering

Karen Willcox, Co-Director
Professor of Aeronautics and Astronautics