



College of Engineering and Mathematical Sciences Vision

The College of Engineering and Mathematical Sciences aspires to provide the highest quality science and engineering education with state of the art facilities that will foster collaborative learning and research to enable students and faculty to achieve their full potential.

College of Engineering and Mathematical Sciences Mission

To inspire students and faculty to boldly address the challenges of society and provide students with practical skills and a passion for life-long learning.

College of Engineering and Mathematical Sciences Values

- Excellence
- Service
- Education
- Research
- Outreach
- Stewardship of resources
- Ethics & Integrity
- Creativity & Discovery
- Diversity
- Entrepreneurship & Innovation
- Collaboration & Partnership
- Participation & Collegiality





Objective 1: Ensure Educational Excellence and Student Success

Objective 2: Achieve Research and Scholarly Excellence

A summary of what we have accomplished over the last four years and strategies for accomplishing each objective along with metrics for assessment are detailed on the following pages.



Background:

The landscape of higher education is evolving, and we cannot and should not ignore this reality. Indeed, we might consider ourselves fortunate that so much change is being thrust upon us at a time when we are being given the tools to successfully address the emergent challenges. As educators, we are tasked with cultivating the great problem-solving minds that will tackle the great challenges that face society. We tell students that STEM education is about teaching them how to adapt; to learn the skills necessary to face difficult tasks. We are all aware that this same message applies to all of us as educators. Change is often beneficial, as it allows us to find ways to empower each individual to contribute toward the common good.

We the faculty, staff and administration are committed to developing a culture that affirms and protects the dignity, discipline and intellectual excitement of academics for higher education to remain vital. The design of our future requires that we look beyond the words and numbers of our policies and to instill a trusting and flexible medium to provide for and respect the continued professional development of all members of our college. Each and every one of us has a role to play in the future success of CEMS.

Academia is changing in myriad ways: teaching methodologies and students' expectations in the classroom are ever-changing; new technology constantly presents us with both real and false efficiencies; and funding uncertainties are forcing us to rethink our areas of scholarship at the same time that expectations for productivity are on the rise. We are committed to finding the optimum balance between teaching, research and service.

The college and university leadership is committed to recognizing, cultivating and rewarding achievement in order to generate an upward spiral of productivity. The byproducts of this process are the commodities that enable us to ascend in the rankings. This is not only critically important for attracting faculty and students, but also for establishing the foundational base of economic stability that can be reinvested in generating further achievement.

Academia must take a broad view of professional identity and development, directing faculty to recognize their strengths and to think about evolving in the dual space of the needs of the institution and the capacity of the individual. We cannot longer think that the apportionment of time and responsibilities should be uniform across a diverse professoriate, and that we should not incent people and have indicators to measure their productivity. We must respect the diverse contributions of the faculty by giving opportunities for everyone to contribute to achieving our maximal collective effectiveness. When we do this, we will be solving our greatest problem and learning from our own curriculum.



Key Objectives: The College of Engineering and Mathematical Sciences will focus its energy and resources on driving progress on two-key strategic objectives:

Objective 1: Educational Excellence & Student Success

Strategies/Goals:

1. **Recruit, develop, support and retain a diverse world-class faculty and instructional staff dedicated to education, research, technology development, and entrepreneurship**
 - Continue to build a diverse and talented faculty dedicated to the vision of the College.
 - Develop a faculty-mentoring program – appoint a CEMS faculty mentoring coordinator.
 - Develop methods to encourage and support faculty and instructional staff to innovate with educational practices.
 - Continue to refine the flexible workload policy that recognizes the variety of ways which faculty can contribute to the vision of the College.

2. **Recruit, support and retain the best undergraduate and graduate students, especially underrepresented populations**
 - Support appropriate rigor in the curricula such that all students are challenged and supported towards their fullest potential.
 - Focus on the monitoring of student satisfaction and progress as the college strives to achieve its graduation and retention goals.
 - Implement plans to increase retention such as peer mentoring, internships, implementation of the 4 year plan and increase activity and support for student organizations and incentivize students to get involved early in their academic careers.
 - Hire a graduate student coordinator that will help with the recruitment of graduate students such as Graduate Student Visit Day, processing of graduate applications, development of graduate recruitment materials, as well as this person being a resource for graduate students that might have questions about their graduate degree programs - graduation requirements, graduate school forms, etc.
 - Implement the pre-masters Global Gateway Program to recruit more self-funded graduate students as well as develop additional MS degree programs that can attract self-funded students such as a MS in Biomedical Engineering and Engineering Management.

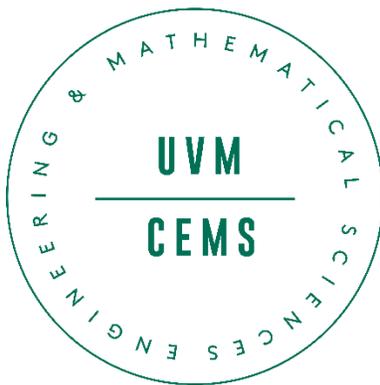


3. Continually improve and innovate curricula

- Develop and support programs to meet the evolving needs of students and society – such as the UVM sustainability, writing and diversity requirements as well as emerging areas of interest such as renewable energy, complex systems, data science, and entrepreneurship.
- Maintain ABET accreditation for all engineering programs and NEASC accreditation for all our programs and build a continual assessment processes.
- Incorporate more project-based learning with an emphasis on transferable skills, hands-on labs and experiential learning.
- Support student activities and leadership opportunities; make more leadership experiences available to CEMS student - increase the support for student organizations as well as student activities.
- Develop effective Internet-based learning approaches for both on-campus and off-campus students.
- Develop a technical communication component of the curriculum.
- Develop additional diversity courses in the college as fulfillment of the University requirements and as a way to broaden student learning.
- Develop coursework to support the GEN ED sustainability requirement to contribute the College expertise to this important initiative.

4. Enhance administration support

- Evaluate administrative support that would coordinate and evaluate synergistic ways to evolve our undergraduate education such as an Assistant Dean and additional advisors or career support capabilities.





Objective 2: Research Leadership

Strategies/Goals:

1. Identify opportunities for growth or expansion

- o Consider development of programs in areas such as: biomedical engineering, data science, biotechnology, nanotechnology, information-technology, energy, sustainable engineering, and healthcare/disease. These are at the intersection of societal needs and UVM core values/capabilities.

2. Maintain strong core research programs

- o Strategically evaluate the need for faculty as resources become available (either new or existing).
- o Continue to modernize research labs.
- o Evaluate strategic opportunities for Research Assistant or Associate Faculty that can continue to strengthen the research mission of the college.

3. Encourage development of interdisciplinary research, which addresses strategic needs of industry, government, and society

- o Continue to explore partnerships across campus and other Universities, and make certain sufficient administrative support exists to promote success.
- o Reach out to industry to build strategic partnerships with industry and government agencies.
- o Sustain the productive operations and program of the NASA SGC/EPSCoR platform.
- o Create a mindset and incentives that focus on developing new and supporting existing inter-disciplinary research efforts.
- o Expand research into educational opportunities in Engineering and Computer Science.

4. Increase level of administration support for research

- o Evaluate additional administrative support for research in the college such as a graduate coordinator. This individual is expected to work with faculty to help recruit graduate students as well as support our current students.
- o Provide appropriate grant pre- and post- award support.
- o Create seed funding opportunities to support novel research ideas.



Four Year Strategic Goals:

- Create new degree programs in Biomedical Engineering and Data Science & Complex Systems.
- Determine the structure of the engineering programs that will maximize their success.
- Significantly upgrade the infrastructure of the college (e.g. new STEM complex, renovations to Votey & Perkins)
- Raise \$10M in commitments for support for Professorships/Chairs, Scholarships, Programmatic Support and Infrastructure.
- Increase the quality and size of our graduate programs through enhancement to our existing program as well as creation of new degree programs.
- Increase our selectivity of our undergraduate students from 70% to 65%.
- Increase the percent of female students from 19% to 22%.
- Increase our four-year graduation rate from 62% to 65%.
- Increase our one-year retention rate from 87% to 89%.
- Increase the number of students that pursue internships from the current estimate of 60% to 75%.
- Maintain the average class size at less than 35.
- Increase graduate student population from 175 to 250.
- Increase the number of distance courses by 5 per year.
- Increase Undergraduate (UG) Student Credit Hours (SCH) from an average of approximately 38,000 to 48,000 in the next 4 years (26% increase).





Four Year Update:

Over the last four years CEMS has made great strides in seizing and creating opportunities to improve the environment which nurtures the entwined goals of research, education and service. The progress made has created additional opportunities, and the review of the progress and the assessment of the future is an appropriate and helpful act in order to maintain and enhance the momentum achieved. The successes have come in the form of building the faculty and student population, expanding and re-invigorating the curricula, upgrading the infrastructure and enhancing the manner in which we communicate with our community of supporters and strengthening the financial stability of the college.

We have implemented a number of innovations and changes to our curricula. We have created a new a BS in Biomedical Engineering (in partnership with the Medical School), a BS in Data Science and an MS degree in Complex Systems and Data Science. We expect to get approval for three new graduate degrees this year: MS in Biomedical Engineering, MS in Engineering Management and PhD in Complex Systems and Data Science. This would create a complete set of degrees for Biomedical Engineering and Data Science and Complex Systems (BS, MS and PhD).

We have continuously worked to improve the facilities and infrastructure of the college. To this end the new STEM Complex broke ground in mid-May of 2015. This is the largest capital project in University of Vermont history (\$104M). We have renovated some of Perkins as well as making very substantially renovations to Votey. We have substantially upgraded the equipment in the Votey teaching labs, prototype shop and FabLab, and this is allowing us to transform/expand the students hands-on learning experience.

In 2015 we completed the ABET accreditation for our engineering programs and had the best visit in the ABET accreditation history of UVM. In addition, we restructured the School of Engineering into three separate departments: Civil & Environmental Engineering (CEE), Electrical & Biomedical Engineering (EBE) and Mechanical Engineering (ME). This new structure and the enhancements/additions to our academic programs, infrastructure and support, strategically positions us to maximize the potential of our engineering programs.

During this four-year period the University has transitioned to a new RCM budget model: Incentive Based Budgeting (IBB). CEMS has been actively involved in developing models to understand the implications of the new budget model, making changes where appropriate with the result that this is allowing us generate substantial resources to continue to enhance our educational and research mission.



We have implemented a philosophy of moderate growth with increase quality of students. The results have been that over the last four years our undergraduate First Time First Year (FTFY) students have increased from 274 to 344 (25.5%). At the same time the quality of our new students (as measured by the aggregate score used by UVM) has improved by over 19% while increasing the selectivity by 9%. In addition, we have increased the percent of undergraduate female students in our FTFY class from 17.5% to 26.8% (53%).

Over the past four years the following changes have occurred in our graduate student population. The size of our graduate student incoming cohort has increased from 64 to 109 (108%). Our graduate student enrollment has increased from 166 to 260¹ (50+%). We also launched an Accelerated Master's Program (AMP) which includes some tuition incentives and this is helping increase our graduate student population and as a result our AMP students have more than doubled. We are participating in a pre-masters Global Gateway Program which is resulting in an increase in self-funded international graduate students in CEMS.

We have had successful recruitments of faculty that have both strengthened our academic core and expanded our breath of expertise. We have hired twelve tenure track faculty members and we will be conducting eight tenure track searches this fall to continue to enhance our academic core. We have also had great success in adding outstanding instructional strength by hiring twelve lecturers. Additionally, we hired two senior lecturers as "Professors of the Practice" to enhance the senior capstone design programs in Civil and Environmental Engineering and Mechanical/Electrical/Biomedical Engineering.

To strengthen our ability to provide support for our faculty and students, we have hired two additional academic advisors, a graduate coordinator, a lab manager for our engineering departments, a career readiness coordinator, a pre-award and financial support professional, and a communications director.

We have made substantial improvements in the areas of marketing, communications and social media. We have created a hardcopy biannual college newsletter called SUMMIT (http://www.uvm.edu/~cems/?Page=summit.php&SM=_newsmenu.html), and have made significant upgrades to the college website and student recruitment materials. CEMS maintains an active social media presence on Facebook, Twitter and other popular outlets.

To recognize some of our most outstanding faculty members we have appointed five endowed professors and will appoint a sixth one this fall. We also implemented the following annual awards in the college: 1) Outstanding Faculty Performance; 2) Award for Excellence in Teaching; 3) Award for Excellence in Service; 4) Award for Excellence in Advising; and 5) Award for Excellence in Research.



Our development efforts have been highly successful. With support from alumni and friends we have obtained over \$8.0M in new commitments for facilities, scholarship, professorships and programmatic support which allowed CEMS to exceed its capital campaign goal with almost 2 years left to the end of the UVM comprehensive capital campaign. In addition, in the spring of 2015 UVM received the Richard L. Fisher estate gift at a value of \$6.8M which is \$1.8M more than the original commitment of \$5M. Part of this endowment was dedicated to fully fund the Richard L. Fisher professorship in Electrical Engineering and provide \$25K/year for engineering graduate scholarships for VT students.

Over the past four years the enhancements align with and support the objectives of this strategic plan. The objectives, goals and the metrics are intended to ensure that we continue to advance towards accomplishing the vision of the college.¹



¹ As of August 2017



The College of Engineering and Mathematical Sciences strategic plan comprises two primary objectives: *Ensure Educational Excellence and Student Success* and *Achieve Research and Scholarly Excellence*.

Each of the objectives had yearly metrics and here, as we complete the fourth academic year under this plan, it is appropriate to pause and reflect on how the college measures up against these objectives and their associated metrics.

Objective 1: Ensure Educational Excellence and Student Success

- a. Increase selectivity of our undergraduate students from 79% to 65%.

AY13-14	AY14-15	AY15-16	AY16-17	AY17-18	AY18-19
79%	76%	70%	69%	70%	

As measured by the FTFY students for the fall of that FY (i.e. Fall 2014 = AY14-15)

- b. Increase the quality of our incoming class as measured by their ACE score from 5.14 to 6.0.

AY13-14	AY14-15	AY15-16	AY16-17	AY17-18	AY18-19
5.14	5.51	5.73	5.99	6.12	

As measured by the FTFY students for the fall of that AY (i.e. Fall 2014 = AY14-15)

- c. Increase the percent of female students in our incoming class from 17.5% to 25%, thus exceeding the national average.

AY13-14	AY14-15	AY15-16	AY16-17	AY17-18
17.5%	22.0%	23.7%%	23.1%	26.8%

As measured by the FTFY students for the fall of that AY (i.e. Fall 2014 = AY14-15)

- d. Increase our four-year graduation rate from 61% to 65%.

Spring 14	Spring 15	Spring 16	Spring 17	Spring 18
55.8%	59.0%	55.5%	59.5%	

As measured by students starting in fall & graduating four springs later (i.e. Fall 2010 => Spring 2014)



- e. Increase the number of students that pursue internships from the current estimate of 60% to 75%.

AY13-14	AY14-15	AY15-16	AY16-17	AY17-18
NA	NA	60%	70%	

As measured by students participating in internships in that fiscal year (7/1 – 6/30)

- f. Establish a Co-op program for our students and enroll at least 10 students.

AY13-14	AY14-15	AY15-16	AY16-17	AY17-18
NA	NA	NA	2	

As measured by students participating in internships in that fiscal year (7/1 – 6/30)

- g. Maintain the average class size at less than 35.

AY13-14	AY14-15	AY15-16	AY16-17	AY17-18
	23.3	29.2	31.2	

- h. Increase the number of distance courses by 5 per year.

AY13-14	AY14-15	AY15-16	AY16-17	AY17-18
		22	13	24



Objective 2: Achieve Research and Scholarly Excellence

a. Increase our graduate student population from 150 to 225 (50% increase).

AY13-14	AY14-15	AY15-16	AY16-17	AY17-18	AY18-19
149	190	182	210	250+*	

* as of 8/15/2017

b. Increase the number of proposals submitted for external funding by 10%.

AY13-14	AY14-15	AY15-16	AY16-17	AY17-18
		111 (\$17,626,529)	103 (\$14,989,029)	

QUESTIONS?

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