
2.0

General Background and Context

2.1 UW/CoE History³

The University of Wisconsin - Madison College of Engineering (CoE) has a long history of providing a premier engineering education in the State of Wisconsin. While the University of Wisconsin was founded in 1849, it wasn't until 1857 that the Department of Theoretical and Practical Engineering was created by the Board of Regents. In 1860, engineering instruction was discontinued on the campus, but was reinstated in 1862 when the Morrill Act provided for military instruction on campus and the University allowed military instructors to teach engineering courses. Colonel W. R. Pease was named the first professor of engineering in 1868, and the first regular class in engineering (three civil engineering students) graduated in 1873. In 1904, the name was changed to "College of Engineering." Over the years, the college continued to grow, additional degrees were approved, and the school gained national renown.

³The University of Wisconsin-Madison College of Engineering, <<http://www.engr.wisc.edu/coehistory.html>> (January 12, 2015).

2.2 CoE Profile

In the most recent U.S. News & World Report rankings of the best engineering graduate schools, the UW-Madison College of Engineering is #14. At the undergraduate level, the college is also #14.

In addition to being one of the nation's top twenty engineering schools, the UW-Madison College of Engineering is the premier engineering program in the state of Wisconsin. UW-Madison CoE has the largest offering of engineering degrees, nationally recognized faculty, and the most extensive, progressive and cutting edge research of all the engineering programs in UW System. UW-Madison CoE offers its students extensive internship, co-operative and study abroad opportunities along with a post-college job placement rate of 94%, including undergraduate and graduate students, surpassing all other UW System engineering programs.

The UW-Madison College of Engineering presents a unique educational experience in the state of Wisconsin with the co-location of undergraduate degrees and the emerging expectation that engineering graduates be more diverse in skill sets and able to provide leadership in areas of global challenge and synthesis of contributions to complex problems. It also represents a unique set of opportunities amongst the university system in terms of research circumstances, initiatives, and accomplishments. The integration of engineering capabilities as a "transformational mechanism" for scientific discovery is a critical component of the commercialization of innovative ideas. This

UW CoE in 2014¹:

By the Numbers

Undergraduate program rankings

- Biomedical engineering—#25
- Chemical engineering—#5
- Civil engineering—#13
- Computer engineering—#14
- Electrical engineering—#19
- Industrial/manufacturing engineering—#9
- Materials engineering—#17
- Mechanical engineering—#17
- Nuclear engineering—#2

Graduate program rankings

- Biomedical engineering—#23
- Chemical engineering—#6
- Civil engineering—#15
- Computer engineering—#16
- Electrical engineering—#18
- Engineering Professional Development, distance degrees—#6
- Environmental engineering—#20
- Industrial/manufacturing engineering—#10
- Materials engineering—#15
- Mechanical engineering—#13
- Nuclear engineering—#3

Faculty excellence

- 30 professors named to the National Academy of Engineering
- 4 professors named to the National Academy of Sciences
- 2 professors named to the Institute of Medicine
- 120 faculty recipients of National Science Foundation Presidential Young Investigator, PECASE, or CAREER awards

¹The University of Wisconsin-Madison College of Engineering, <<https://www.engr.wisc.edu/fastfacts.html>> (May 28, 2015).

process is more efficient, and facilitated by proximity and integration of disciplines and collaborative experiences, including the UW School of Medicine and Public Health. (the fastest growing group in the CoE is Biomedical Engineering). *Figure 2A* illustrates the various groups on campus with which CoE faculty and students engage.

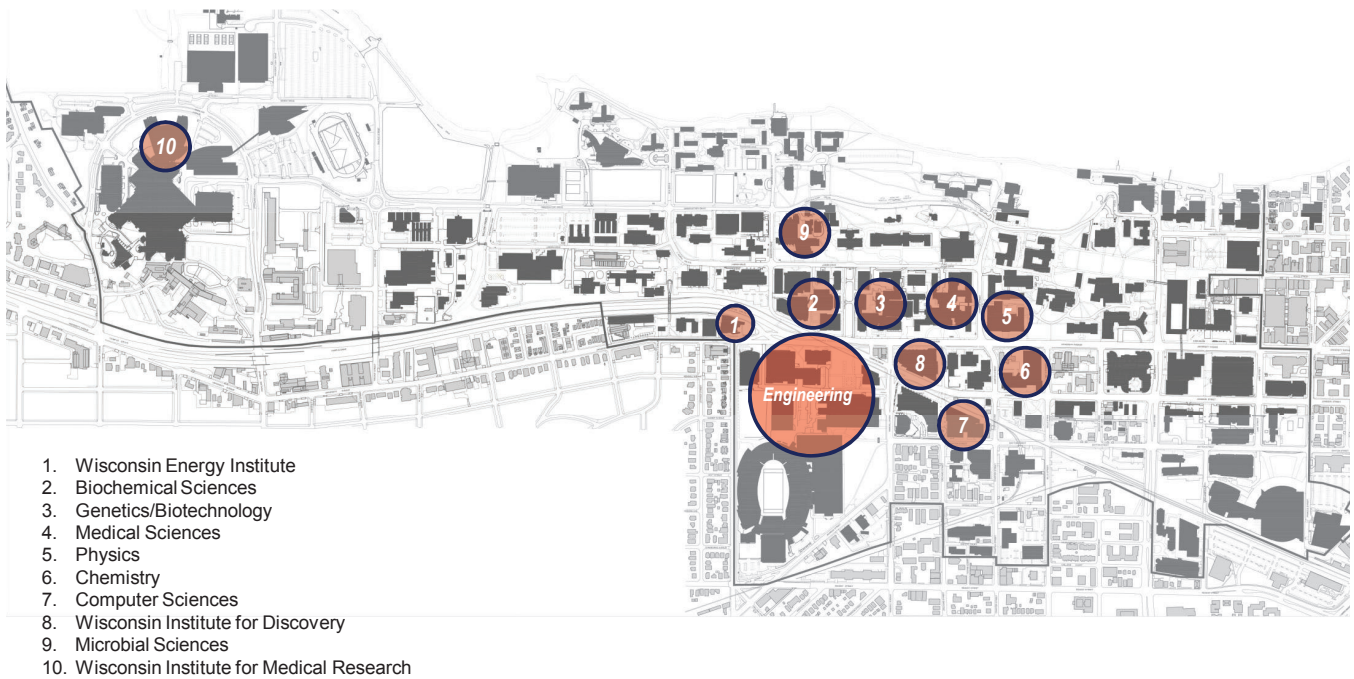


Figure 2A: CoE Interdisciplinary Connections

The college academic programs also include several certificates and interdisciplinary degree programs. Additionally, it offers a suite of internationally acclaimed professional master's degrees, including six online master's degrees.

CoE Student and Faculty Profile

2013:

- Undergraduate Students – 4,320
- Graduate Students – 1,700
- Faculty (T/TT) – 181 actual
- Faculty (T/TT) – 216 projected¹

2015:

- Projected Undergraduate Students – 4,675¹
- Actual Undergraduate Students – 5,000²
- Projected Graduate Students – 1,750¹
- Projected Faculty (T/TT) – 250³

2021³:

- Undergraduate Students – 6,000
- Graduate Students – 2,250
- Faculty (T/TT) – 300

¹Projected numbers per Paulien analysis

²Actual number as of 4/2015

³Projected numbers based on actual undergraduate population and preferred ratio of 20:1

The main engineering campus is located south of Campus Drive and is bounded by Breese Terrace on the west and North Randall Avenue on the east. The Water Science and Engineering Laboratory is located on Lake Mendota. The college is comprised of eight buildings totaling approximately 751,398 ASF⁴ / 1,395,218 GSF:

⁴4,323 ASF outside agency/non-useable space is not included in total ASF.

	<u>ASF</u>	<u>GSF</u>	
1. Engineering Hall	265,802	464,768	
2. Engineering Research Building	84,479	157,510	
3. Engineering Centers Building	112,402	251,334	
4. 1410 Engineering Drive	34,390	63,561	
5. Materials Science and Engineering Building	25,547	44,726	
6. Mechanical Engineering Building	153,783	297,993	
7. Water Science and Engineering Laboratory	26,540	40,867	*Note: the CoE has a small presence in the Wisconsin Energy Institute, but was not considered as part of the CoE inventory.
8. Wendt Commons	52,778	74,459	
9. Wisconsin Energy Institute*	N/A	N/A	

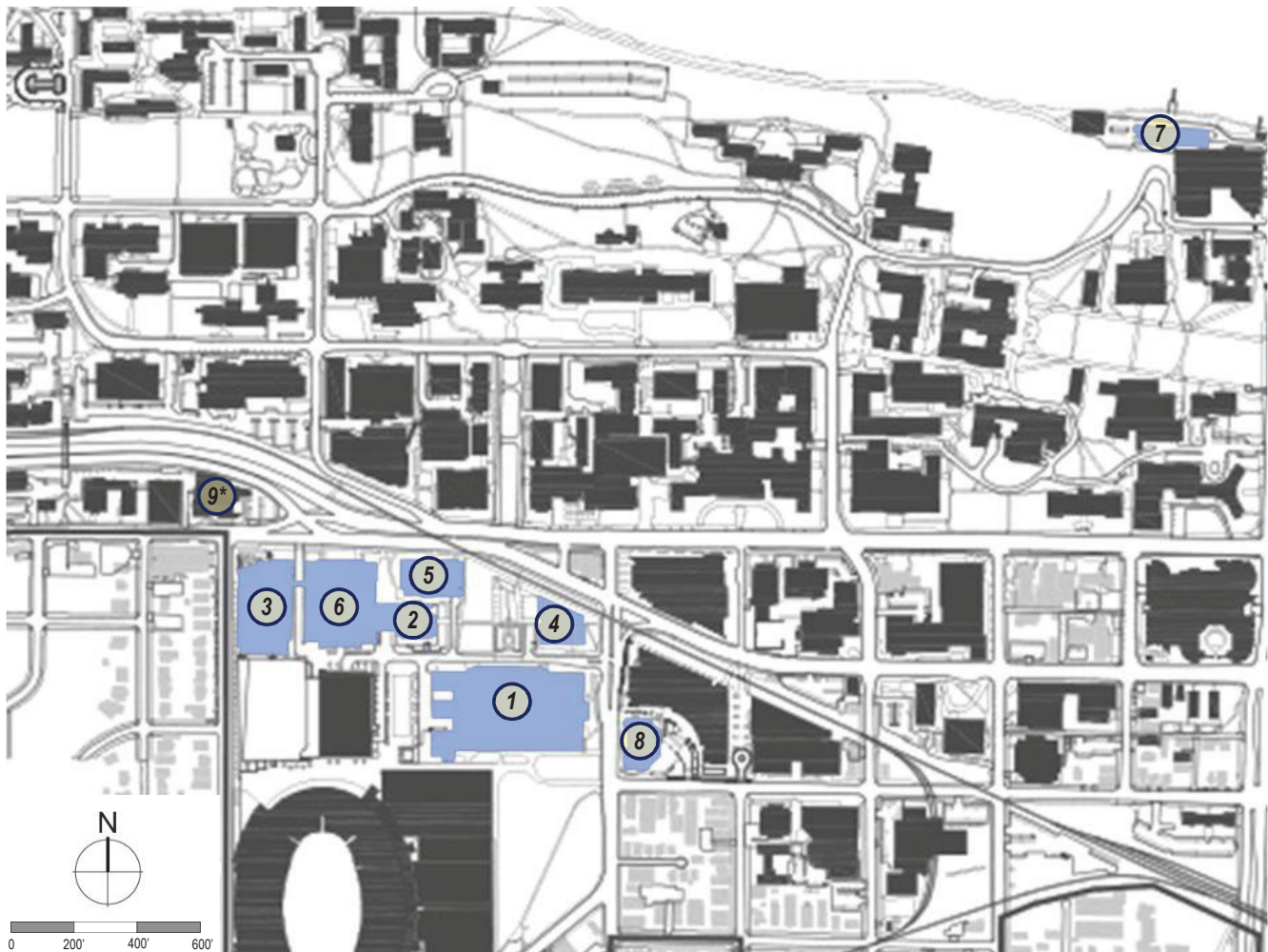


Figure 2B: CoE Master Plan Campus Map

2.3 Previous Planning Efforts

The CoE Facilities Master Plan is the first formalized, in-depth facility planning and assessment effort undertaken by the College of Engineering in over twenty years. Major facility projects undertaken by the College between 1995 and 2005 were based on the College's in-house study of facility needs. No new construction projects or major facility improvements have been made to College of Engineering since 2005.

The CoE Facilities Master Plan project was conducted in collaboration with the Wisconsin State Department of Facility Development, UW System, and UW-Madison Facility Planning and Management under the professional guidance of Flad Architects. It builds upon the work that was done by the UW-Madison campus in 2005 when the Campus Master Plan was developed.

The 2005 UW-Madison Campus Master Plan was developed to guide development of the campus for the next 20 years and beyond, and looked at replacing obsolete and costly to maintain facilities, decompressing overcrowded spaces,⁵ improving relationships to open space and proposing improvements to campus connectivity. The Master Plan identified buildings for remodel or removal based on the evaluation of their physical integrity, the condition or their major systems, and their ability to meet current and future program needs. At the time, a significant increase in the student population was not considered.

Two of the existing College of Engineering buildings – 1410 Engineering Drive and the Engineering Research Building – were identified for replacement with two new structures in the 2005 Campus Master Plan. A third building – Wendt Commons – was identified for replacement with a green space.

Also identified as priorities for planning and development in the 2005 UW-Madison Campus Master Plan was the completion of the Wisconsin Institute for Discovery and the redevelopment of the Union South block.⁶ These two projects, immediately adjacent to the CoE precinct, were recently completed and have greatly contributed to the overall identity/quality of this portion of the campus.

The campus is currently in the process of developing the 2015 Campus Master Plan Update, which will confirm the planning principles, goals, objectives and major recommendations – including proposed building sites – of the 2005 master plan.

In addition, the team has built the Facilities Master Plan in conjunction with the College of Engineering Strategic Plan and departmental strategic plans as the basis for analysis and determination of space needs. The University of Wisconsin-Madison College of Engineering Strategic Plan 2011-2015 was provided at the start of the CoE Master

⁵The University of Wisconsin-Madison, *2005 Campus Master Plan*, Executive Summary, p. 5.

⁶The University of Wisconsin-Madison, *2005 Campus Master Plan*, Conclusion, p. 20.

Plan study. During the process, the CoE developed an updated Strategic Plan for 2015-2020, which was shared with the team and finalized at the beginning of 2015. Mission, vision, and core values, per the updated Strategic Plan are included in the Introduction of this Master Plan report.

In addition, the team reviewed individual departmental strategic plans where available.

2.4 Project Originators/Project Drivers

The need to develop a Facilities Master Plan for the CoE was driven by the following influences:

- Rapid, unexpected increase in student enrollment
- Underutilized and aging facilities
- Changes to engineering pedagogy
- Pressure to recruitment and retain first-class faculty and students

Based on these drivers, the CoE recognized the need to gain a clear understanding of its current facility capabilities in order to maintain its reputation as a nationally-ranked engineering program.

Currently, the CoE facilities are unable to meet the growing demand for advanced active learning environments, world-class research space, and collaborative environments that are flexible and adaptable in order to accommodate new directions within engineering. There is a need to develop a plan that will lead an orderly academic and physical development of the CoE campus that meets not only the short term space needs, but also moves the college towards meeting its long term strategic plan goals. The following bullets summarize key project originators and drivers:

Originators:

- Societal drive for new engineers – 10,000 per year nationally.
- Underlying need to develop a plan that cohesively organizes drivers, factors, and features noted below in one cohesive document to lead orderly academic and physical development of the CoE campus.

Research:

- Become leaders of, as opposed to partners in, large research enterprises:
 - Compete for major research funding.
 - Develop a Trans-disciplinary Institute organized around three initiatives at the outset.
 - Define and accommodate new directions for research within engineering.

- Accommodate changes in the research environment:
 - Develop a critical mass of research staff.
 - Provide sufficient “infrastructure” that is flexible and adaptable.
 - Increase use of shared facilities such as characterization tools, synthesis, and processing labs.
- Reputation and Ranking(s):
 - Maintain and have available quality space for new recruits as well as existing faculty.

Education:

- Reputation and Ranking(s):
 - Develop leaders and leadership in engineering... not just engineers.
 - Enhance the Global context, cultural overlaps, diversity of thinking.
 - Continue to produce “Preferred hires” (95% placement).
- Changes in Engineering “Learning:”
 - Provide more “hands-on-learning” spaces.
 - Provide spaces that accommodate “design programs” that integrate student experiences/activities.
 - Support learning environments that are team-based and promote communication skills in addition to discipline knowledge.
- Facility Implications:
 - Provide more spaces that accommodate class sizes between 80 and 150 students
 - Provide more spaces that support emerging teaching styles/active learning
 - Address immediate short term needs for classroom spaces to handle increased/increasing number of undergrads.

Campus Planning

- Eliminate deferred maintenance of existing facilities.
- Make highest and best use of land (building densities/floor area ratios).
- Establish life cycle expenditures and thresholds for continued investment.

Measures of Success

- Provide a clear understanding of what capabilities/facilities currently exist based on a rigorous approach of data gathering.
- Maximize utilization of current space.
- Identify options for space improvement based on the “highest and best use.”
- Prioritize facility improvements to align with critical needs including research space opportunities, classroom flexibility, class/section size, recruiting strategy, etc.
- Identify funding requirements and explore accelerated delivery to keep pace with competitive peer institutions
- Accommodate growth in students (from 4,500 current to 6,000 target) and related faculty/staff (from 181 to 250-300).
- Improve the identity/quality of the CoE campus consistent with CoE and Campus branding, and consistent with recent developments at this end of Campus (WID, Union South).

