

# University of New Mexico Department of Civil Engineering 2015-2020 Strategic Plan

The Department of Civil Engineering at the University of New Mexico has a long history of excellence in teaching, research and service that has improved the lives of New Mexicans and those beyond our borders. Our graduates create the infrastructure that enables communities of every size to thrive. The infrastructure built and maintained by civil engineers, construction engineers, and construction managers supplies clean drinking water while protecting water resources, creates a reliable and safe transportation system and delivers the energy that lights our homes and powers our economy. While much has been accomplished with the help of civil engineers, construction engineers, and construction managers there are many existing and emerging challenges. This strategic plan is designed to ensure that the department and its graduates remain well positioned to meet society's demand for safe, reliable and sustainable infrastructure in a rapidly changing world.

## Strategic Focus Areas

### Transportation

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The department's transportation engineering program takes a wide look at the technology, infrastructure, policy, and human behavior that affect the safety, reliability and sustainability of transportation systems. Our teaching, research, and outreach focus on two broad areas: Intelligent Transportation Systems, and Sustainable Transportation System Planning. The intelligent transportation systems (ITS) area focuses on finding more efficient ways to use our existing physical transportation infrastructure by applying advanced sensor and communications technology coupled with adaptive computer control systems to ease congestion, improve safety, and collect new travel information to support planning decisions and research. The sustainable transportation system planning area focuses on developing new methods for evaluating the effectiveness and efficiency of regional transportation system plans and policies with the aim of discovering more environmentally and financially sustainable solutions. These aims are supported by collecting new travel behavior information, developing novel forecasting and prediction models, and evaluating decision making frameworks.

### Environmental & Water Resources

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Water is a critical issue to the State of NM and water systems are a fundamental element of local, state, and national infrastructure. We will focus on the relationship between water, energy, and the environment, including collaborations with other researchers at UNM that are focusing on energy. We will focus on watershed response and implications to infrastructure from climate change, including changing patterns of drought and flood. We will focus on the use of algal fuel cells for energy production, minimizing the environmental impacts of water and wastewater treatment, and treatment of contaminants in the environment.

### Structural/Geotechnical/Materials

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Our research efforts are focused on developing quantifiable metrics for sustainable structural design and integrating those metrics and principles in our undergraduate curriculum. We are investigating alternative cementing materials that have a lower carbon footprint than current Portland cement. We will also focus on developing methods to enhance durability and longevity of construction materials using nanotechnology. Finally, we will direct our efforts towards developing robust methods for structural health monitoring of current energy infrastructure such as nuclear power plants, developing multi-scale computational models to predict structural performance of energy infrastructure, and introduce a new generation of structural materials (e.g. ultra high performance concrete – UHPC) for developing sustainable energy infrastructure.

## Construction Engineering and Management

Construction engineering and management professionals have a principle role in creating sustainable infrastructure. We will focus on educating a workforce and conducting research in project delivery methods that integrate the design and construction processes (e.g., design-build; concurrent engineering and construction; lean construction), systems dynamics in construction (such as modeling and simulation of construction operations; risk management; and overcoming uncertainties in construction), and sustainable construction practices.

### Strategic Planning Goals

The faculty met for an all-day planning retreat during the spring semester of 2015. While many needs and priorities were discussed, several common themes emerged. The faculty identified increasing the department's visibility and student success as being critical to the department's future. The faculty also expressed a need to remain competitive with leading institutions. These three items are considered the department's strategic goals. The importance of each goal is explained below, along with specific objectives and action items to help the department achieve each goal.

#### Goal 1: Increase Department Visibility

While the department has contributed significantly to the wellbeing of New Mexicans as well as those outside our borders, and continues to do so, it remains unclear how well this is understood. The faculty expressed a need to increase the visibility of the department's contributions to decision makers, industry, prospective students and society in general. The aim of this goal is to expand support for the department's educational, research and service activities while also attracting a larger and more diverse cohort of students. Accomplishing the following objectives is expected to move the department towards its goal of increasing visibility.

##### Objective 1A: Consider changing the department's name.

A new department name that describes the department's activities in more detail may increase visibility.

<i>Action Items</i>	<i>Responsibility</i>	<i>Time Frame</i>
Determine UNM process for changing the department's name	Strategic Planning Committee & Department Chair	AY 2015-2016
Solicit proposals from the faculty for a new name <ul style="list-style-type: none"><li>• Each proposals shall include:<ul style="list-style-type: none"><li>○ The proposed name</li><li>○ A clear rationale for the proposed name change including, the expected benefits to the department, school or university.</li></ul></li><li>• Distribute proposals to the faculty for review</li><li>• Hold a faculty meeting to discuss proposals and name change process<ul style="list-style-type: none"><li>○ Conduct faculty vote or iterate if necessary</li></ul></li></ul>	Strategic Planning Committee & Department Chair	AY 2015-2016

**Objective 1B: Create a public identity for the department that concisely describes the importance of our diverse research and academic programs in today’s society and the future.**

The department’s faculty engage in a diverse range of research topics. Those outside of the field, including government officials, businesses, colleagues in other disciplines, and potential students may not know the full range of our research and educational activities or understand the common themes that tie them together.

<i>Action Items</i>	<i>Responsibility</i>	<i>Time Frame</i>
Create a short narrative (e.g., like the first paragraph on this strategic planning document) or info graphic that can be placed on our website and other promotional materials that explains the importance of what we all do in everyday terms.	Strategic Planning Committee	AY 2015-2016

**Objective 1C: Promote the department’s research accomplishments and activities.**

<i>Action Items</i>	<i>Responsibility</i>	<i>Time Frame</i>
Proactively seek opportunities for publicity. <ul style="list-style-type: none"> <li>• Coordinate with UNM Media Relations (<a href="https://ucam.unm.edu/media-relations/index.html">https://ucam.unm.edu/media-relations/index.html</a>) to promote new research findings and publications.</li> <li>• Karen Wentworth, Senior University Communications Representative,</li> </ul>	All Faculty	AY 2015-2020
<b><i>Continuing Activities</i></b>		
<ul style="list-style-type: none"> <li>• Produce department newsletters on a regular schedule.</li> <li>• Advertise department at external events such as the paving and transportation conference, the BIM conference, and lectures that the department sponsors.</li> <li>• Invite nationally recognized scholars to provide seminars and visit the department.</li> </ul>		

**Goal 2: Increase Enrollment of Well Prepared Students**

**Objective 2A: Identify how students view the department’s academic programs.**

It is currently unclear what factors affect a student’s decision to major in Civil Engineering, Construction Engineering, or Construction Management and choose UNM. A better understanding of these factors would help the department target its marketing activities to grow its enrollment and may also inform changes to our curriculum.

<i>Action Items</i>	<i>Responsibility</i>	<i>Time Frame</i>
Survey our current students, ask about factors involved in their decision to attend UNM and major in Civil Engineering, Construction Engineering, or Construction Management.	Strategic Planning Committee & Instructors	AY 2016-2017
Investigate the possibility of surveying potential (i.e., high school students or freshman) students about their views of civil engineering at UNM. <ul style="list-style-type: none"> <li>• Before/after first semester (or year) survey to understand if expectations were met &amp; reasons why students leave the department.</li> </ul>	Strategic Planning Committee and Instructor for CE160	AY 2016-2017
Investigate current UNM and SOE marketing information and strategies.	Strategic Planning Committee	AY 2016-2017

**Objective 2B: Attract well prepared students.**

<i>Continuing Activities</i>
<ul style="list-style-type: none"> <li>• Provide judicious use of scholarships</li> <li>• Regularly review entrance requirements</li> <li>• Maintain an active and up to date website</li> </ul>

**Objective 2C: Increase online education.**

Online education is an opportunity to reach new students and expand access to education.

<i>Action Items</i>	<i>Responsibility</i>	<i>Time Frame</i>
Evaluate success of MCM online degree program	Graduate Committee	AY 2016-2020
Investigate potential to offer additional degrees and courses online and departmental incentives to encourage faculty to develop online courses.	Graduate Committee	AY 2017-2020
<i>Continuing Activities</i>		
<ul style="list-style-type: none"> <li>• Offer MCM degree completely online.</li> <li>• Develop marketing strategy for online degrees (and courses).</li> </ul>		

**Goal 3: Continue to Develop an Innovative Curriculum that Creates Engineers and Construction Managers Who Will Change New Mexico and the World**

The faculty have been making incremental changes to the department’s curriculum for undergraduate and graduate students. While these changes have helped streamline and modernize the curriculum, improving student success and ensuring that the department’s students have the right skills for tomorrow’s challenges remain a priority. Achieving these goals brings with it at least two benefits beyond our graduates own success and their contributions to society. Higher achieving graduates will contribute to increasing the department’s visibility and a more innovative curriculum may help grow enrollment and increase diversity. Accomplishing the following objectives is expected to move the department towards its goal of continuing to develop an innovative curriculum.

**Objective 3A: Improve communication skills.**

Strong communication skills, in particular written communication, are essential for student success. The faculty believe that student’s communication skills should be improved

<i>Action Items</i>	<i>Responsibility</i>	<i>Time Frame</i>
Investigate ways to better integrate core communications courses with each of our degree curricula. For example, align technical writing courses with civil engineering technical electives.	Undergraduate Committee	AY 2016-2017
Investigate what communication skills students are currently taught in UNM core courses and reinforce these skills in courses offered by the department. For example, hold written work products to the same standards as in core English and communications courses.	Undergraduate Committee	AY 2016-2017
Enhance curriculum so that communications skills are reinforced throughout the degree program. For example, ensure that there is a writing intensive (or presentation intensive) course each semester in a typical student’s schedule. Ensure that written work products and presentations in these courses are	Undergraduate Committee	AY 2016-2018

<p>rigorously evaluated and detailed feedback are provided to students.</p> <ul style="list-style-type: none"> <li>• Investigate resources required to accomplish this including: <ul style="list-style-type: none"> <li>○ Hiring additional TA's with experience in technical writing instruction to evaluate and provide feedback on writing assignments.</li> <li>○ Faculty course release so that additional effort can be placed on developing writing and communication intensive components to existing courses, provide detailed feedback and evaluation, and monitor progress in communication skills.</li> </ul> </li> </ul>		
<p>Investigate methods to track communications skills. The FE exams provides a great metric for disciplinary core knowledge but we currently have nothing similar for communications skills.</p>	Undergraduate Committee	AY 2016-2018

**Objective 3B: Training engineers and construction managers to be leaders.**

Our students can contribute to society not only through professional engineering or construction work but through leadership. Leadership may include engaging in public policy formation, holding public office, creating innovative new technologies and start-up companies, and running a successful business.

<b><i>Action Items</i></b>	<b><i>Responsibility</i></b>	<b><i>Time Frame</i></b>
Investigate if there are models to follow from other programs at UNM or elsewhere.	Strategic Planning Committee	AY 2016-2017
Develop a course that can be part of UNM's innovation academy.	Undergraduate Committee	AY 2016-2018
Develop or list courses for inclusion in UNM's honors college curriculum.	Undergraduate Committee	AY2015-2017
Incorporate service learning opportunities into existing courses.	Interested Faculty	AY 2015-2020
<b><i>Continuing Activities</i></b>		
<ul style="list-style-type: none"> <li>• Maintain and promote student involvement in professional associations and their on-campus student chapters</li> </ul>		

**Objective 3C: Measure student success.**

The faculty rely mainly on the outcome of the FE exam to track engineering student success. However, the FE exam does not fully capture important outcomes, such as student's communication skills, success in fulfilling professional goals (e.g., employment as an engineer or success in graduate school) and the impact they may have on society after they graduate. Furthermore, the results of the FE exam which takes place during a student's final year at UNM are difficult to trace back to specific interventions made by the faculty in prior years. The department should develop performance metrics and collect data that allow the faculty to judge the success or specific interventions, programs or the curriculum as a whole.

<b>Action Items</b>	<b>Responsibility</b>	<b>Time Frame</b>
Improve tracking and reporting of FE exam results to the faculty. For example, provide UNM civil engineering student FE exam results over time by subject area, along with comparable national data, in an easy to access location and format.	Undergraduate Committee	AY 2015-2020
Track the success of construction management students using the results of the AIC exam.	Undergraduate Committee	AY 2015-2020
Investigate ideas to measure communication skills.	Strategic Planning Committee	AY 2016-2018
Investigate ideas to track what students do after they graduate.		
Ensure that plans to change the curriculum include plans to measure expected outcomes.	All Faculty	AY 2015-2020
Present performance metrics regularly, for example at beginning of academic year department retreats.	Undergraduate & Graduate Committee	AY 2015-2020

#### **Goal 4: Increase Competitiveness with Leading Institutions**

The faculty believe that achieving many of its goals, including those not specially discussed in the strategic plan, requires reconsidering support for its core academic missions: education and research. A goal of adjusting support so that it is commensurate with that of the top 50 civil engineering departments is considered a desirable target. The faculty identified the following as priorities for consideration for additional support.

- Research facilities and laboratory space
- Teaching loads
- Faculty salaries
- New faculty and staff positions
- Faculty support for international student recruitment
- More TA positions for PhD students, taking place of courses taught by adjuncts
- Improve junior faculty mentoring, specifically with regard to developing externally funded research programs.

<b>Action Items</b>	<b>Responsibility</b>	<b>Time Frame</b>
Develop a series of regular junior faculty mentoring workshops or meetings that target specific needs of civil engineering junior faculty.	Senior Faculty	AY 2015-2020
Identify courses which may be taught by TAs and standards for selecting TAs.	Undergraduate and Graduate Committees	AY 2015-2017