

## **Quality Improvement Plan Construction Science and Management**

### **PREFACE**

Nearly 300 students are pursuing a degree in construction science and management, one of more than 75 programs nationally accredited by the American Council for Construction Education (ACCE). This program attracts highly qualified students from across the nation.

The program prepares graduates to execute the designs created by engineers and architects. Graduates may enter fields of general, commercial, residential, heavy and highway, industrial, utility, mechanical, or electrical construction. Their education provides the fundamental engineering and management skills necessary for success in any of the above areas.

Outstanding faculty possess the academic credentials, professional training, and strong links to professional and service organizations that are vital to the success of the department. The department faculty has extensive professional experience as architects, design engineers, project engineers/managers, construction managers and estimators. These professional qualities expose the students to both theory and practice in an established learning environment. Faculty commitment to a quality education for the students is reflected in the industry demand and high rate of career placement.

The department values the professional capability of the faculty gained from working with professional firms, and the construction industry. The faculty members are very profession-oriented and this is considered to be one of the main strengths of the department. Ten are registered professional engineers (three are SE), three are registered architects, three LEED A.P., two LEED G.A., one HBDP, one DBIA, and one OSHA certified 500 instructor. Faculty members continue to be active and generally well-represented in local professional societies, engineering education societies, and national professional societies. Many of these professional organizations are affiliated with the student professional chapters and their activities which supports the professional development of the curriculum, student activities, and enhances professional identity. The faculty have been very successful in receiving numerous teaching and advising awards, and other forms of professional and academic recognition.

### **FOCUS OF THE ASSESSMENT PROCESS**

Construction Science and Management graduates should be prepared to assume positions of leadership in the vital, ever-expanding construction industry. Graduates must possess both technical and managerial competencies as the curriculum combines studies in mathematics, engineering, and the basic sciences with studies in business and management methods as they apply to construction. Graduates become project managers, general superintendents, estimators, cost engineers, schedulers, facility managers, expeditors, purchasing agents, office managers, sales engineers, building inspectors, field engineers, developers, and owners of construction operations. Among over 150 construction programs in the United States, Kansas State's program is recognized as one of the very best. To continue that level of quality, frequent evaluation of the program is necessary.

Major instructional, scholarship, and service responsibilities of the department consist of teaching approximately 50 classes each semester with 17 full-time faculty dedicated to nearly 600 students in two programs within the department. Scholarship responsibilities include working

with students and industry to advance the understanding of engineering and construction aspects of building structural, mechanical, electrical, and acoustical systems integration into the design, engineering and construction of a building. This scholarship of application is essential and critical to the teaching and learning process for students and faculty. Service responsibilities include advising student professional organizations, providing technical and managerial service to industry, and providing support to community organizations and activities. The following assessment process has been implemented to measure and provide continuous improvement of these critical responsibilities.

## **Program Outcomes and Assessment**

Our focus is to provide a learning environment of value to students and of benefit to industry, the academic community, and society as a whole. We are committed to focusing individual attention and resources to achieve the highest standard of excellence in undergraduate education for architectural engineers and constructors. We strive to prepare our students for successful life long careers and to provide leadership in the industry with our educational programs. We promote excellence in faculty and student performance related to instruction, scholarship, and service through the following items:

## **Strategic Plan**

The faculty of the Construction Science and Management program and industry leaders have authored and approved this strategic plan in support of the University, College, and Department Missions.

## **Mission – Department of Architectural Engineering & Construction Science**

Our mission is to provide a learning environment of value to students and of benefit to industry, the academic community, and society as a whole. We are committed to focusing individual attention and resources to achieve the highest standard of excellence in undergraduate education for Architectural Engineers and Constructors. We strive to prepare our students for successful life long careers and to provide leadership in the industry with our educational programs. We promote excellence in faculty and student performance related to instruction, research, and service.

## **Department Vision**

The Kansas State University Department of Architectural Engineering and Construction Science will be a recognized leader in providing a quality education to prepare students for successful careers in their respective professions.

## **Program Educational Objective**

The Department faculty and industry leaders established the following educational objective for the Construction Science and Management undergraduate program:

*“Within the first few years following graduation from the four year Construction Science & Management program at Kansas State University, graduates are expected to be working as a professional in an area closely related to construction, contributing to the success of their employer, pursuing professional development and/or certification, and advancing professionally with confidence and experience in the construction industry.”*

## **Program Goals, Objectives, and Learning Outcomes**

**GOAL 1: EDUCATIONAL PROGRAM** – The program, through course and curriculum quality, will provide an education that will promote a leadership role in construction and prepare the student to become a responsible member of society.

### **Secondary goal:**

A. Graduates will possess the abilities of the Program Learning Outcomes (PLO's) detailed in the objectives below:

#### **Objective 1. Technical Knowledge Program Learning Outcome – Graduates shall be able to:**

**1.a.** Apply engineering, science, and math fundamentals to solve construction problems.

#### **Objective 2. Construction Process Program Learning Outcomes – Graduates shall be able to:**

**2.a.** Understand and analyze the construction process, materials, system assemblies, equipment and requirements.

**2.b.** Read, understand, and analyze contracts and contractual relationships.

**2.c.** Develop and prepare quantity take-offs and construct cost estimates.

**2.d.** Understand and analyze cost control systems.

**2.e.** Understand and evaluate administrative, operational, and legal aspects of the construction process.

**2.f.** Compose and revise a project plan and schedule.

**2.g.** Understand and interpret structural, mechanical, electrical, and plumbing systems.

**2.h.** Understand and analyze construction safety standards and programs and create a project safety plan.

**2.i.** Evaluate and interpret construction laws, codes, and regulations.

**2.j.** Understand material procurement and management.

**2.k.** Understand and analyze contract documents.

**2.l.** Understand and select appropriate project delivery systems.

#### **Objective 3. Communication Program Learning Outcomes – To communicate effectively, Graduates shall be able to:**

**3.a.** Create appropriate oral presentations.

**3.b.** Create appropriate written documents.

**3.c.** Use appropriate graphic depiction.

#### **Objective 4. Leadership, Management and Teamwork Program Learning Outcome – Graduates shall be able to:**

**4.a.** Apply Construction Management skills by effectively working with cross-disciplinary teams.

#### **Objective 5. Technology Program Learning Outcomes – Graduates shall be able to:**

**5.a.** Apply technology (computers) for analysis and communication.

**5.b.** Apply technology and instrumentation in field layout.

#### **Objective 6. Professional Development/Life Long Program Learning Outcome – Graduates shall:**

**6.a.** Use Self-directed inquiry as a basis for Life-Long Learning.

#### **Objective 7. Ethics Program Learning Outcome – Graduates shall be able to:**

**7.a.** Analyze and evaluate ethical and professional behavior in preparation for an effective industry career.

**GOAL 2: FACULTY** – The faculty will possess appropriate training, academic qualifications, and professional experience, and pursue scholarly activities, professional development, and promote quality teaching, advising, and service essential to the educational process.

**Secondary Goals:**

A. To promote academic development of the faculty members to provide quality teaching and learning through the courses offered within the program.

**Objective 1. Faculty should strive to provide professional, high-quality instruction and to maintain and improve teaching effectiveness.**

**Objective 2. Faculty members should be involved in workshops and seminars to improve their teaching methods.**

**Objective 3. Faculty should work in collaboration with other faculty in the department and others across the college and campus.**

**Objective 4. Faculty should be prepared and strive to provide strong academic and career advising.**

**Objective 5. Faculty should keep current with changes in technology as they apply to courses taught in particular, and construction in general.**

B. To promote faculty Professional Development.

**Objective 1. Faculty will be involved with Professional Development by attending seminars, conferences, continuing education courses, and/or workshops.**

**Objective 2. Faculty will provide opportunities for education and industry by offering courses, conferences, and/or workshops for students and industry beyond the curriculum offerings where possible.**

C. To promote service to the university and the public.

**Objective 1. Faculty should attend and participate in industry associations and organizations, serve on committees and task forces, and serve as officers and leaders.**

**Objective 2. Faculty should be involved in community activities and organizations.**

**Objective 3. Faculty should be involved in serving the construction industry through association work and consulting activities.**

**GOAL 3: STUDENTS** – Attract high quality students into our professional programs and facilitate the development of their personal, intellectual, and professional potential.

**Secondary goals:**

A. The faculty should maintain quality academic performance criteria for Construction Science and Management majors.

**Objective 1. The faculty will establish and review criteria for admittance to the Professional Program in Construction Science and Management.**

**Objective 2. The faculty will review and promote academic performance of Construction Science and Management students.**

**Objective 3. The faculty will endeavor to attract high quality students while increasing program undergraduate enrollments consistent with available allocated resources.**

B. The program shall establish a learning environment to promote personal development.

**Objective 1. The program will endeavor to instill in students a desire for life-long learning (Measured through Goal 1, Objective 6a listed above).**

**Objective 2. The program will endeavor to develop technically competent students/graduates that understand construction materials and processes to identify and solve engineering/construction problems through critical and creative thinking (Measured through Goal 1, Objectives 1a and 2a).**

**Objective 3. The program will provide individual development opportunities for communication skills in oral presentation, written documentation, and graphical representation (Measured through Goal 1, Objectives 3a, 3b, & 3c).**

**Objective 4. The program will facilitate opportunities and encourage student participation in undergraduate creative inquiry and student competitions.**

C. The program should continue to establish a learning environment that promotes technology skills.

**Objective 1. The program will provide the individual student with an understanding of and abilities to use the many evolving technologies available for the industry (Measured through Goal 1, objectives 5a and 5b).**

D. The program shall provide an environment to promote professional development.

**Objective 1. The opportunities for students to be involved with professional societies and student chapters of various associations.**

**Objective 2. To improve the student/graduate's ability to work, interact, and coordinate with others in a 'team' environment and exhibit leadership in setting and attaining objectives (Measured through Goal 1, Objectives 4a).**

**Objective 3. To improve the student/graduate's ability to understand and demonstrate ethical and professional behavior (Measured through Goal 1, Objective 7).**

**GOAL 4: FACILITIES** – Develop and maintain facilities to accommodate academic and administrative activities that support and enhance the educational process.

**Objective 1. Maintain existing facilities and equipment in excellent working condition to provide an environment conducive to learning.**

**Objective 2. Plan for future facilities and equipment that will improve and benefit the learning environment.**

**GOAL 5: INDUSTRY RELATIONS** – Maintain an active Industry Advisory Council and the construction industry as a whole to assure the continued growth and improvement of our Construction Science and Management program and to strengthening our cooperative link with the architectural/ engineering/ construction (AEC) industry.

**Secondary goals:**

A. To utilize and support the Industry Advisory Council.

**Objective 1. Hold regularly scheduled advisory council meetings with appropriate current agenda discussion.**

**Objective 2. Provide departmental support by giving informal curriculum reviews.**

**Objective 3. Review annually the advisory council processes and activities.**

B. Provide opportunities for professional support for the program and for industry.

**Objective 1. Endeavor to invite industry representatives to attend and support the program through departmental functions and learning activities.**

**Objective 2. Provide assistance for students to link with industry for cooperative work experiences, internships, and permanent employment within the construction industry.**

C. Provide for continuing education opportunities for industry.

**Objective 1. Organize/ conduct quality continuing education workshops.**

D. Develop additional external funding.

**Objective 1. Increase scholarships and discretionary funding through new and existing relationships with industry partners and other funding sources.**

Our department faculty members are committed to providing an educational environment where our students can reach their full potential in the study of Construction Science and Management, and as individuals and citizens. As an entire faculty, we are committed to continuous educational process improvement based on total quality management methods, and an integrated outcomes/assessment plan. The focus of our on-going improvement efforts centers on our program outcomes and what our graduates are expected to know and be able to do after completing the Construction Science and Management curriculum.

## *Program Outcomes*

The program goals, objectives, and outcomes were established by the faculty based on our educational objectives, accreditation requirements, and interaction with our industry advisory board. The outcomes developed are across the disciplines of the program, as stated in the program educational objectives, to ensure a broad and balanced education in the construction process and the management of construction. Additionally, the breadth of our educational objectives and the university's general education requirements are incorporated into the curriculum to prepare our graduates for the challenges and opportunities for life in general.

The program objectives and outcomes will be reviewed annually and revised as appropriate. The CNSM Program Assessment Committee (**CNSM PAC**) will provide the leadership for continuous educational process improvement and oversee the implementation of program assessment and curricular improvement.

## *Assessment Process*

This process utilizes a variety of sources and multiple methods of obtaining data. This data provides a broad base of information relative to performance and the achievement of our educational objectives and desired program outcomes. Sources and methods include the following:

1. **Construction Science and Management Industry Advisory Council** – members of the advisory council come from all facets of the construction industry. The council convenes two times annually to provide valued feedback and input for program improvement and department support. Specifically, the council provides some input in establishing departmental goals and plans, program objectives and learning outcomes, and curriculum/course content.
2. **Graduating Senior Exit Survey** – all seniors are required to fill out an exit survey prior to graduation.
3. **Alumni Surveys** – one and five-year alumni are surveyed for evaluation of their educational programs.
4. **Employer Feedback** – systematic surveys and year round conversations with present and future employers provide feedback in regard to graduate performance relative to program learning outcomes.
5. **ACCE Accreditation Review** – a national peer review is made every six years by the ACCE, which establishes national standards for construction education programs.
6. **Academic Performance and Classroom Assessment are conducted through Instructor Surveys for each course each semester** – faculty are involved in assessing and progressively developing program learning outcomes and course student learning outcomes in courses and throughout the curriculum.
7. **Academic Advising Survey** – This is a university survey conducted each fall semester with the results published in April of the subsequent semester.

The surveys, data, and summaries of these assessment instruments are available upon request.

The faculty are responsible for implementation of the assessment plan through the department committee structure. The CNSM PAC provides leadership in establishing program educational objectives and program learning outcomes, developing assessment plans and

instruments, reviewing and summarizing data, and coordinating curriculum and course improvements. This committee reports to the faculty as a whole where final decisions are made regarding assessment results requiring possible revisions or actions. This committee also reviews the Mission, Goals, and Objectives (program learning outcomes) of the program and submits any revisions to the entire faculty.

Various subcommittees may be appointed to function under the CNSM PAC and assigned specific responsibility areas for the purpose of addressing concerns that may arise from the annual program reviews. The CNSM PAC responsibilities and assessment inputs are summarized on a continuous feedback diagram called the **Assessment Process Flowchart**. The assessment instruments may be considered as “sensors” in a closed loop control process with the committee recommending any necessary corrective action.

The **Course/Outcomes Matrix Link** document indicates the ties between the Program Learning Outcomes defined by the Construction Science and Management program and the courses required in the program. Additional links are indicated between the university Student Learning Outcomes and the program’s objectives and Learning Outcomes.

As indicated and previously described, the faculty establish the program educational objective and program learning outcomes with input and/or reference to college, university, and ACCE criteria. The Industry Advisory Council interactively participates in the refinement of the objectives and outcomes and will participate in curriculum and broad course review on a cyclical basis.

Curriculum requirements are reviewed annually by the CNSM PAC with input from the faculty as a whole. Curriculum improvements are recommended by the CNSM PAC to be acted on by the faculty.

In order to understand where and to what level the program learning outcomes are achieved, the curriculum outcomes matrix was developed and is updated on an annual basis.

(HERE WE WILL DEFINE ITEMS FROM THE MOST RECENT ASSESSMENT REPORT THAT APPEAR TO BE PROBLEMS AND WILL REQUIRE MONITORING, REVISION, OR CORRECTION IN THE PROGRAM. THIS WILL INCLUDE THE UPDATING OF THE PROGRESS OF CORRECTIONS IDENTIFIED IN PRIOR ASSESSMENT REPORTS.)

This matrix, in conjunction with feedback from the industry advisory council and employers, has provided formative assessment indicating outcomes (oral and written communication, teamwork and computer skills) which needed more intentional development in the curriculum. The first step in addressing these needs has been taken with activities and problems embedded into existing departmental courses.

Additionally, the faculty has participated in establishing ability criteria and standards which suggest performance criteria specific to each of the program outcomes. This list allows an individual a more specific and consistent means to evaluate the outcomes in a way that can be reinforced progressively throughout the curriculum.

As indicated on the **Assessment Process Flowchart**, the CNSM PAC will oversee, administrate and summarize advisory board interaction, employment records, employer surveys, senior exit survey and 1 and 5-year alumni. An annual summary report for the prior academic year with recommendations will be provided by the beginning of the fall semester to the CNSM



PAC. The Academic Affairs/Professional Program Committee will track the academic performance of individual students, administer the enrollment to the professional program and oversee student advising. An annual summary report with any recommendations from the Academic Affairs/ Professional Program Committee will be made to the CNSM PAC by the end of the spring semester. The CNSM PAC will be responsible for reporting on-going assessment plan implementation and curriculum improvement recommendations. This process recognizes that all faculty must participate and understand the overall program assessment plan. The responsibilities are an integral part of the department organizational plan/committee overlay and individual annual performance reviews.

Other actions from this assessment process have produced positive results. Actions for the last academic year may be found in the **Annual Progress Report on Assessment of Student Learning for Undergraduate Programs** which may be found on the department's website.