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**Bachelor of Science in Civil Engineering
Assessment of Student Learning Plan** BY:.....
Kansas State University

Check the box if your program's student learning outcomes have been modified since November 2003. If so, please email the revised outcomes (apr@ksu.edu) or attach a hard copy to this document.

A. College, Department, and Date of this Submission

College: Engineering
Department: Civil Engineering
Date of Submission: November 10, 2004

B. Contact Person(s) for the Assessment Plans

Lakshmi Reddi, Department Head
Robert Stokes, Undergraduate Program Director

C. Program – degree, minor, or certification

BS in Civil Engineering

D. Assessment of Student Learning Three-Year Plan

1. Student Learning Outcome(s)

Our department will focus on the following five learning outcomes in our three-year assessment plan.

Each of our students will:

- Demonstrate an understanding of mathematics, science, and engineering principles necessary to solve problems in four major areas of civil engineering (Outcome 1.1).
- Demonstrate an understanding of business, economics, project management, and other related issues of civil engineering (Outcome 2.3).
- Demonstrate the ability to create and deliver quality oral presentations (Outcome 3.4).
- Demonstrate an understanding of professional and ethical responsibilities of the practice of civil engineering (Outcome 4.1).
- Recognize the importance of professional licensure and the need for lifelong learning and continuing education (Outcome 4.2).

Special rationale for selecting these learning outcomes (optional):

These five outcomes have been selected from the complete list of fifteen (15) outcomes developed and adopted by the faculty, students, and advisory council members of the Department of Civil Engineering. The five outcomes broadly represent the educational objectives/goals of the department.

Relationship to K-State Student Learning Outcomes (insert the program SLOs and check all that apply):

Program SLOs	University-wide SLOs (Undergraduate Programs)					Program SLO is conceptually different from university SLOs
	Knowledge	Critical Thinking	Communication	Diversity	Academic / Professional Integrity	
1.1	x	x				
2.3	x		x		x	
3.4	x		x			
4.1	x			x	x	
4.2	x				x	

2. How will the learning outcomes be assessed? What groups will be included in the assessment?

Please refer to the table attached.

3. When will these outcomes be assessed? When and in what format will the results of the assessment be discussed?

Please refer to the table attached.

4. What is the unit’s process for using assessment results to improve student learning?

Please refer to the table attached.

**Department of Civil Engineering
Student Learning Assessment Plan**

Learning Outcome	How Assessed	Groups Included	When Assessed	When/how Discussed	Use of Results
1.1 Understanding of Math, Science, Engineering...	2(D),1(I)	4,2	1,2	2,3	1,3
2.3 Business, Economics, Management	2(D),3(D),4(I)	4,2,3	1,2	2,3,4	2,3
3.4 Oral Presentations	3(D),1(D),4(I)	1,2,3	1,2	2,3,4	3
4.1 Professional and ethical responsibilities	6(D),2(D)	5,4	1,2	1,3	3
4.2 Professional licensure	5(D),6(D)	5	1,2	3,4	3

How Assessed

- 1 Exams, homework, projects (D): Faculty members assess students' performance in courses directly linked to learning outcomes. Exams/quizzes conducted to see if students possess the prerequisite knowledge in mathematics and science principles at the semester beginning of courses such as Mechanics of Materials are examples of indirect assessment of outcome 1.1. In a few courses, project presentations serve as direct assessment of students' ability to create and deliver quality oral presentations (outcome 3.4)
- 2 FE exam results (D): Fundamentals of Engineering (FE) Examination is conducted by the National Council of Examiners for Engineering and Surveying (NCEES). In the morning part of this exam, mathematics, science, and engineering principles are covered. Metrics have been established (see attached) as performance criteria for direct assessment of the outcomes 1.1, 2.3, and 4.1.
- 3 "Capstone" design course (D): Students' performance in this course provides us with a direct assessment of their understanding of business, economics, project management aspects of civil engineering (outcome 2.3) and of their ability to deliver quality oral presentations (outcome 3.4). A questionnaire is used in all the design presentations that would allow quantitative grading of students' oral presentations by the audience (which consists of fellow students, faculty, and occasionally other civil engineering practitioners).
- 4 CE015, CE101, ASCE Chapter, Chi Epsilon (I): Student assembly meetings, introductory course CE 101, and leadership activities of the ASCE (concrete canoe, steel bridge) and Chi Epsilon provide an opportunity to indirectly assess the students' understanding of business, economics, and project management aspects (outcome 2.3) and their oral communication skills.
- 5 Number taking FE Exam (D): Professional licensure is an important element in civil engineering practice. The number of students who appeared for the FE Exam is a direct measure of their recognition of the importance of professional licensure.
- 6 ASCE Membership (D): The number of students who became student members of ASCE is considered to be a direct measure of students' understanding of professional responsibilities of the practice of civil engineering and of their need for lifelong learning and continuing education (outcome 4.1)

(D) = Direct measure

(I) = Indirect measure

Groups Included

- 1 Students during oral presentations fill the questionnaire and grade oral communication skills of their peers.
- 2 Faculty members interpret NCEES (FE Exam) scores and also provide direct assessment on outcomes that are directly tied to course performance (ex. outcome 1.1)
- 3 Advisory Council members have a unique opportunity to directly assess students' oral communication skills and their understanding of business, economics, and project management aspects during the student group presentations at semi-annual meetings.
- 4 NCEES provides us with results from the standardized FE exam (12 subjects during the morning session including basic sciences, mathematics, engineering, and ethics; 11 subjects during the afternoon session including civil engineering courses, construction management, and legal & professional aspects)
- 5 Department Head conducts the exit interviews and formulates questions directly related to learning outcomes (ex. Number of students taking FE exam, Number of students who have become student members of ASCE, etc)

When Assessed

- 1 Each semester: Outcomes that involve FE scores are assessed once in Fall and once in Spring. Outcomes involving capstone course are also assessed every semester (since capstone course is offered every semester). Exit interviews by the Department Head are done at the end of every semester.
- 2 Annually: Faculty members assess the outcomes corresponding to their individual courses at the end of every year.

When/How Discussed

- 1 Exit interviews: Face-to-face interviews with graduating seniors offer an excellent opportunity to discuss the assessment results from previous years with students.
- 2 Faculty meetings: Conducted at least once a month, these meetings allow in-depth discussion by faculty of the

assessment results and the necessary action plans.

- 3 Faculty retreats: Conducted once a year, the retreats allow approximately one-half day to be dedicated to curriculum issues, learning outcomes assessment, and future action plans and corrective actions.
- 4 Advisory Council meetings: Conducted once during Fall (usually third week of September) and once during Spring (first week of April), these meetings allow one-half day long discussion of SLO assessment results.

Use of Results

Metrics are used wherever possible (see attached documentation on FE scores) to evaluate the assessment results. Corrective actions usually include one or more of:

- 1 Revise course content
- 2 Revise curriculum
- 3 Revise instruction method

**FE exam Metrics for the
Civil Engineering Program
at
Kansas State University:**

(Approved by CE Faculty on December 10, 1999)

1. Metric for establishing overall level of confidence in FE results:

Percentage of graduating seniors who took the FE exam with the PM area Civil Engineering = X

Require that $X \geq 90\%$

Comments: Data needed for this metric can be obtained from students' Exit Interviews. Generally, the value of X should provide us with the level of confidence associated with the proposed FE exam-related metrics listed below.

2. Metric for overall FE percentage passing:

Percentage of examinees passing the FE exam = Y

Require that $Y \geq \text{Maximum \{National Average \% Passing or 85\%}\}$

3. Metrics for Science, Mathematics and General Engineering Subjects (i.e., AM subjects):

- a) *Our average percent correct in each area of i) Chemistry, ii) Dynamics, iii) Fluid Mechanics, iv) Mathematics, v) Mechanics of Materials, and vi) Statics \geq Minimum \{National average percent correct in that category or 60%\}*

Example: Require that our average percent correct in Mathematics be greater or equal to the *minimum* of either the National average percent correct in Mathematics or 60%.

- b) *Our average percent correct in each area of i) Computers, ii) Electric Circuits, iii) Engineering Economics, iv) Ethics, v) Material Science/Structural of Matter and vi) Thermodynamics \geq Minimum \{National average percent correct in that category or 40%\}*
- c) *Our average percent correct in at least 9 out of the 12 indicated AM subjects \geq National average percent correct in those categories.*

4. Metrics for Civil Engineering Subjects (i.e., PM subjects):

- a) *Our average percent correct in each area of i) Environmental Engineering, ii) Hydraulics and Hydrologic Systems, iii) Structural Analysis, iv) Structural Design, v) Soil Mechanics and Foundation, and vi) Transportation Facilities \geq Minimum { National average percent correct in that category OR 60% }*

Example: Require that our average percent correct in Structural Analysis be greater or equal to the *minimum* of either the National average percent correct in Structural Analysis or 60%.

- b) *Our average percent correct in each area of i) Construction Management, ii) Computers and Numerical Methods, iii) Legal and Professional Aspects, iv) Surveying, and v) Water Purification and Treatment \geq Minimum { National average percent correct in that category OR 40% }*
- c) *Our average percent correct in at least 8 out of the 11 indicated PM subjects \geq National average percent correct in those categories.*

Comment: Data source for 2, 3 and 4 is Report 5 of the National Council of Examiners for Engineering and Surveying (NCEES).

Action Strategies to Assure Meeting FE Exam Metrics

(Approved by CE Faculty on December 10, 1999)

Action Strategy Number 1:

When Report 5 of the National Council of Examiners for Engineering and Surveying (NCEES) is received, the Program Assessment Committee (PAC) should evaluate the results against all of our FE exam metrics. The evaluation outcome should indicate which metrics have been met and which metrics have not been met.

Action Strategy Number 2:

This action strategy is invoked only when any of the general metrics [i.e., metrics 1, 2, 3(c) and 4(c)] is not met. The recommended step-by-step action procedures are given below:

1. Not meeting the metric for the first time should be considered as a CONCERN in that category but no action(s) should be developed or implemented. Wait for the next cycle of FE results.
2. If for the second consecutive time the metric is not met for the same category, then this should be considered as a WEAKNESS in that category. In this case, the PAC should draft an action plan to resolve this weakness. This plan should be discussed and approved by the faculty during one of their faculty meetings. Minor adjustment actions can be implemented pending the approval of the faculty. Wait for the next cycle of FE results.
3. If the same metric is not met for the third consecutive time, then this should be considered as a DEFICIENCY in that category. Accordingly, the action plan approved in step 2 should be revised, if needed, and then fully implemented.
4. The process of evaluation-implementation should continue until the metric under consideration is met for two consecutive times.

Action Strategy Number 3:

This action strategy is invoked only when any of the metrics for the AM or PM subject areas [i.e., metrics 3(a), 3(b), 4(a) and 4(b)] is not met. The recommended step-by-step action procedures are given below:

1. Not meeting the metric for the first time should be considered as a CONCERN for all courses related to the indicated subject area. This concern should be brought, via appropriate channels, to the attention of the faculty responsible for teaching these courses. No action(s) should be developed or implemented at this stage. Wait for the next cycle of FE results.
2. If for the second consecutive time the metric is not met for the same subject area, then this should be considered as a WEAKNESS for all courses related to the indicated subject area. If the subject area is within the control of the CE Department, then the faculty responsible for teaching these courses should draft an action plan to resolve this weakness. This plan should be discussed and approved by the CE faculty during one of their faculty meetings. If the subject area is outside the control of the CE Department, then the Department Head and the PAC should coordinate with the appropriate channels to draft an action plan to resolve this weakness. Minor adjustment actions (if the subject area is within the control of the CE department) can be implemented pending the approval of the faculty. Wait for the next cycle of FE results.
3. If the same subject area metric is not met for the third consecutive time, then this should be considered as a DEFICIENCY for all courses related to the indicated subject area. Accordingly, the action plan approved in step 2 should be revised, if needed, and then fully implemented.
4. The process of evaluation-implementation should continue until the metric under consideration is met for two consecutive times.