Program of Self-Study For
Chemical Engineering

Description of Assessment Methodology

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Program of Self-Study For Chemical Engineering
Description of Assessment Methodology

1. Assessment Methods

Assessment methods are ways to gather evidence demonstrating that those outcomes important to the missions and educational objectives are being measured, i.e., outcomes indicators. The following items outline the methods used to collect evidence of desired outcomes as suggested by ABET as well as those selected by this department.

Some of the program outcomes can be measured using "devices" administered by the department; others depend on external assessment. In addition, some program outcomes can be assessed using direct measures while others will probably have to be inferred by observing student behaviors or by indirect measures such as student self-reporting.

The assessment methods listed below were selected for use in this department when the plan was established in 1997. During the past five assessment cycles, some modifications have been made to the original plan. The original and current plan is discussed. A description of each item's process is outlined on the following pages. Copies of the assessment forms are presented in Appendix III-2.7.

1. Senior Design Projects
    A. Faculty Assessment
    B. Peer Assessment
2. Portfolios
3. Nationally-normed Examination: Fundamentals of Engineering
4. Alumni Surveys
5. Employer/Recruiter Surveys
6. Placement Data/Exit Interviews
7. Course Evaluations
8. Co-op
    A. Supervisor Surveys
    B. Student Assessment

The following matrix shows which goals are addressed by which assessment methods.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Senior Design: faculty			X	X	X		X				X	X	X	X
Senior Design: peer	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Portfolios	X	X			X		X				X			
FE Exam	X				X	X			X				X	X
Alumni Surveys	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Recruiter/Employer Surveys	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Placement/Exit Interviews	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Course Evaluations	X		X		X									
Co-op: Supervisor Surveys	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Co-op: Student Assessment	X	X	X	X	X	X	X	X	X	X	X	X	X	X

1) Senior Design Projects

This is one of the most important elements of the assessment plan because capstone senior design projects are used to evaluate the students' comprehensive technical knowledge gained in this undergraduate program.

There are two parts to this assessment method. The first involves faculty assessment of student learning and the second involves student assessment of fellow student learning. Every year, the faculty will review final design projects to assess whether there are any across the board weaknesses. Projects will be evaluated independently of course grades. The following goals will be addressed by the faculty ratings: C, D, E, G, K, L, M and N. Ratings on the whole must demonstrate that the students met or exceeded the standards for these criteria on the following scale: Unsatisfactory, Needs Improvement, Meets Standards, or Exceeds Standards. The assessment form is given in Section III.2.7The evaluation will include ratings for the reports in the following areas:

Communication skills:

* Mechanics (grammar, spelling, style, punctuation, use of references)
* Appropriate for audience (detail, technical level)
* Organization
* Use of graphics (tables, diagrams, figures, pictures)

Content:

* Arguments and appropriate conclusions/recommendations
* Issues of health, safety, and the environment
* Meets project minimum criteria (two different separations, a chemical reaction, and necessary economic analysis)

The faculty assessment is currently being used as was established in 1997.

In addition to the faculty assessment component, each student will complete a peer-assessment of each of the members of his or her team at the end of each semester in which senior design is offered. A copy appears in Section III.2.7. The rating form information is not used to determine any student's grade. Rather the information is gathered to provide another source of assessment of student outcomes from the students' points of view. All goals will be addressed by the student ratings. The desired outcome is an average score of 3.0 or above for each criterion.

2) Portfolio Assessment

When established in 1997, the faculty determined which goals are best addressed by portfolios. Then, they determined which class(es) best address those goals. They also determined which

items will be collected to be included in the portfolio assessment. Finally, a stratified random sample of work from those classes, such as finals exams, will be selected each time student work is collected.

Portfolio assessment were to be conducted at the end of each calendar year and represent the graduating class from each (e.g., the class of 1998). Each portfolio was to be comprised of a total of 24 items with six samples of each of the four items kept: one representing an exceptional performance, four representing an average performance, and one representing a poor performance. The faculty member teaching each of the courses from which the samples were taken selected the samples. Listed below is a summary of the criteria/goals that to be assessed from each item. In faculty review of student portfolios, ratings of portfolios on the whole demonstrate evidence of the stated corresponding criteria such that students must meet or exceed standards on the following scale: Unsatisfactory, Needs Improvement, Meets Standards, or Exceeds Standards. A rubric was also created to assist the faculty in assessment efforts.

Item	Criteria/Goals Addressed
431 Lab IV final reports	A, B, G, K
421 Reactor Design final exams	A, E
405 Separations (final) homework assignments	A, E
412 Plant Design oral presentations	G

Portfolios were used for the first four assessment periods. Faculty did not feel the original form allowed for a good assessment. The form was revised after the second assessment period and used for the next assessment. After using the new form for two assessment periods, the faculty decided to discontinue the use of portfolios in the assessment process. It was felt that the portfolios were more a measure of the faculty's ability to write effective tests and homework than the outcomes of our students. Also, the plant design presentations are a factor of the faculty's assessment of senior design.

The use of portfolios was discontinued beginning with the 2001-2002 assessment period.

3) Nationally-normed Examinations

The faculty and student representatives have selected the Fundamentals of Engineering (FE) exam to assess student outcomes because it is believed to provide the best nationally-normed assessment of student learning in the field of engineering. In addition, the numbers of students in this department who take other nationally-normed examinations such as the GRE are typically very small, and, therefore, not representative of the population. Students will be strongly encouraged to take the FE exam during their senior year, either in the fall or the spring. Typically, at least half of the students eligible to take the exam have elected to take it. The School of Engineering and Mines offers review sessions for the 12 parts of the exam. Chemical engineering faculty members have historically been involved in leading one or multiple review sessions.

Data, starting with the spring of 1987, have been obtained from the School of Engineering and Mines and are stored in a spreadsheet for longitudinal comparison. The database will be updated after each report is received. The numbers of UND chemical engineering students taking, passing, and failing each exam are recorded. The department will also monitor the percentage of eligible students electing to take each exam. National pass rates for all test takers as well as chemical engineering majors are recorded and compared with those of the Department of Chemical Engineering at UND.

The FE exam pass rates will be used to measure performance in three major goal areas: A=an ability to apply knowledge of mathematics, science, and engineering, E=an ability to identify, formulate, and solve engineering problems, and I=a recognition for, and an ability to engage in life-long learning. In addition, student performance on three parts of the FE will be monitored for three corresponding goals: ethics for F=an understanding of professional and ethical responsibility, economics for M=experience in engineering economics, and chemistry for N=AIChE (grounding in chemistry).

A pass rate of 80% on the overall exam has been set as a desired outcome for this measure. A pass rate that is equal to or above the national pass rate for chemical engineers has been set for the minimum acceptable outcome. In regards to performance on the three subset areas, a score that is equal to or above the national average score for chemical engineers has been set for the desired outcome.

This tool is still used as originally designed.

4) Alumni Surveys

The alumni survey provides the faculty with an external perspective. The survey asks for responses that document professional accomplishments and career development activities as well as assessment of learning while in the program. The assessment form is presented in Section III.2.7. Two groups will be surveyed each year to gain longitudinal data: one year out and three years out. For example, in August 1998, the 1997 and 1995 graduates will be surveyed.

This particular assessment tool will be used to assess all goals stipulated by this department. However, each goal has been assigned a weight based on its relative priority in the improvement process. A different level of agreement or strong agreement will be used in this manner. [The initial assessment plan was developed with the following as the desired outcome.]

At least 80% of students will agree or strongly agree that the department met or achieved the criteria for:
A=an ability to apply knowledge of mathematics, science, and engineering
B=an ability to design and conduct experiments, as well as to analyze and interpret data
C=an ability to design a system, component, or process to meet desired needs
E=an ability to identify, formulate, and solve engineering problems
G=an ability to communicate effectively

At least 65% of students will agree or strongly agree that the department met or achieved the criteria for:
D=an ability to function on a multi-disciplinary and/or diverse team
F=an understanding of professional and ethical responsibility
K=an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
L=experience in undergraduate research and engineering in practice
M=an understanding of the role of economics in engineering and an ability to apply that understanding to problem-solving
N=(as submitted by AIChE) a thorough grounding in chemistry and engineering topics, including safety and environmental aspects

At least 50% of students will agree or strongly agree that the department met or achieved the criteria for:
H=the broad education necessary to understand the impact of engineering solutions in global and societal context
I=a recognition of the need for, and an ability to engage in life-long learning
J=a knowledge of contemporary issues of relevance to the field of chemical engineering

We currently use the alumni form devised by the faculty in 1997. We have changed how we interpret the data. The scores of all surveys for a given year are averaged to obtain a mean value for "education received" and "importance to degree". Two criteria were established. To meet our standards, the mean value for "education received" must by 3.5 or higher (on a scale of 1 to 5 with 5 being strongly agree), **and**, the mean value for "education received" must be no more than 0.5 less than "importance to degree".

5) Employer Surveys

Employers of our graduates will receive a survey asking them to rate our graduates and our program. A copy of the form appears in the appendix. We emphasize that we need their assistance in offering the kind of curriculum that will produce graduates with the knowledge, skills, and abilities they need in their company. All goals will be addressed with this assessment tool. In employer surveys, ratings of students on the whole will demonstrate evidence of the stated corresponding criteria such that employers will indicate that graduates of the program met or exceeded their standards. To meet our standards, the mean value for "graduate demonstration of" must by 3.5 or higher (on a scale of 1 to 5 with 5 being strongly agree), **and**, the mean value for "graduate demonstration" must be no more than 0.5 less than "employer significance".

Our original assessment plan also included recruiter surveys. Very few recruiters completed the surveys. We have discontinued the use of recruiter surveys. We also changed how we implement the employer surveys. Originally, the surveys were sent to the Human Relations Department of the employers company. We received one survey for the two-year span1999-2001. Starting with 2002, surveys were sent to the alumni with the alumni survey. Our alumni were asked to hand deliver them to their immediate supervisor. Using this method, are return rate was approximately 50%.

6) Placement Data/Exit Interview

This department concurs that placement data are not the best means of assessing any of the ABET student outcomes. However, these data can provide valuable program information. Thus, two distinct exit interviews will be used. For graduates of the program, a written questionnaire issued during a senior plant design class period will be used (see Section III.2.7) [this is now administered by the chair separate from plant design since a significant number of students in plant design may graduate in August or December]. The department chair will also conduct a focus group with graduating seniors at the end of each semester that will complement the survey. Starting in 2002, the dean also began conducting face-to-face interviews with the graduating seniors. Ratings on the whole will demonstrate evidence of the stated corresponding criteria such that students will indicate "agree" and "strongly agree" on the following scale: Strongly Disagree, Disagree, Neutral, Agree, or Strongly Agree. Special attention will be given to items mentioned in the questionnaire asking for suggestions on what the department could do to improve the program. To meet our standards, the mean value for "education provided you with the ability to" must by 3.5 or higher (on a scale of 1 to 5 with 5 being strongly agree), **and**, the mean value for "education provided" must be no more than 0.5 less than "in achieving your professional goals."

For students who leave the program without graduating, a brief survey will be sent to the student upon notice that the student has withdrawn from the chemical engineering program (see appendix). Special attention will be given to items mentioned in the question asking for suggestions on what the department could have done to prevent the student from leaving the department.

7) Student Evaluations

The UND student evaluation form is given to all students in each chemical engineering course at the end of each semester. In addition, questions asking whether criteria A (an ability to apply knowledge of mathematics, science, and engineering, C (an ability to design a system, component, or process to meet desired needs), and E (an ability to identify, formulate, and solve engineering problems) were achieved through this class are added to the form as numbers 18, 19, and 20 for the following classes:

306 Unit Operations
405 Mass Transfer
408 Process Control
412 Senior Plant Design
421 Reactor Design (Kinetics)

Results are tabulated and returned to the department chair for distribution to the appropriate faculty member. Each faculty member also reviews the semester evaluations with the department chair. Student evaluations of each class each semester are analyzed and changes in teaching style, course syllabus, and/or curriculum are made as warranted. The three criteria listed above, A, C, and E, will be analyzed by the faculty as a whole. The faculty have elected to

set the desired outcome for the goals A, C, and E as an average score of 3.5 or greater. [Student evaluation scores must be adjusted to account for the different numbering system. The evaluation forms list 1 as strongly agree and 5 as strongly disagree. To keep consistent with the rest of our evaluation numbers, evaluation scores are converted to a scale of 5 = strongly agree and 1 = strongly disagree.]

8) Co-op Supervisor Assessment

Co-op students have two types of assessments. The first is an employer evaluation, which is monitored each semester by the Co-op advisor. A copy of the evaluation form appears in Section III.2.7. These reports become part of a student's departmental file. Starting in 2002, the department began asking co-op supervisors to fill out an additional survey relating the student's performance to a-n outcomes. . To meet our standards, the mean value for "student demonstrated ability" must by 3.5 or higher (on a scale of 1 to 5 with 5 being strongly agree), **and**, the mean value for "demonstrated ability" must be no more than 0.5 less employee rated significance".

The second is a student written report, in which the student evaluates his or her experience as it relates to his or her education so far. These reports are collected throughout the year, but evaluated once each year for assessment purposes. Typical reports range from 3 to 5 pages, not including appendices. The report summarizes the student's work experience and discusses in detail some educational aspect of the experience. The report should strive to demonstrate how the educational experience has prepared them for co-op and how co-op has affected their education. All goals will be addressed by this criteria. In co-op supervisor review of students, ratings on the whole will demonstrate evidence of the stated corresponding criteria will indicated that students have met or exceeded standards on the following scale: Unsatisfactory, Needs Improvement, Meets Standards, or Exceeds Standards. The desired outcome is all rankings of met or exceeded standards.

2 Weighted Criteria

When this plan was developed in 1997, the chemical engineering faculty, student representatives and the assessment consultant determined that, while all ABET criteria are very important and valued in this program, some are perceived as being vital and deserve the greatest attention. Thus, the following weighting system was developed to help the faculty determine the priorities for the improvement process.

3 = A weighting of 3 suggests that student inadequacy in this criterion may prevent the student from obtaining the Bachelor of Science in Chemical Engineering degree. If the desired outcomes are not met for these criteria, the department will give improvement in these areas the highest priority. Criteria A, B, C, E, and G have been given a weighting of 3 which means that these five criteria are considered to be the most important goals for this department.

A=an ability to apply knowledge of mathematics, science, and engineering
B=an ability to design and conduct experiments, as well as to analyze and interpret data
C=an ability to design a system, component, or process to meet desired needs

E=an ability to identify, formulate, and solve engineering problems
G=an ability to communicate effectively

2 = A weighting of 2 suggests that student inadequacy in this criterion may prevent the student from obtaining desirable or even passing grades in a particular class or knowledge/skill/ability area. Criteria D, F, K, L, M, and N have been given a weighting of 2 which means that these three criteria are considered important and deficiencies will be addressed.

D=an ability to function on a multi-disciplinary and/or diverse team
F=an understanding of professional and ethical responsibility
K=an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
L=experience in undergraduate research and engineering in practice
M=an understanding of the role of economics in engineering and an ability to apply that understanding to problem-solving
N=(as submitted by AIChE) a thorough grounding in chemistry and engineering topics, including safety and environmental aspects

1 = A weighting of 1 suggests that student inadequacy in this criterion is undesirable and will be addressed, but these goals are not seen as part of the primary mission of this department. Criteria H, I, and J have been given a weighting of 1 which means that these items are of a lower relative priority than the other goals. These goals are also being addressed outside the chemical engineering department through the broad liberal arts education offered at this institution. The faculty do occasionally work with the faculty who teach these courses to offer classes that address the needs of engineering students. In addition, the UND Assessment Committee is continually striving to meet these goals and provides feedback on performance.

H=the broad education necessary to understand the impact of engineering solutions in global and societal context
I=a recognition of the need for, and an ability to engage in life-long learning
J=a knowledge of contemporary issues of relevance to the field of chemical engineering

3 Outcomes, Objectives, Performance Criteria, and Evaluation

This section is one of the core components of our assessment plan because it states very specifically the outcomes, objectives, performance criteria, and Evaluation for this educational program. Each of the parts is defined and outlined below.

Outcomes

Outcomes describe the broad outcomes desired by this department. They are far-reaching ideals and describe the best situation that could be desired. A outcome is a general statement of achievement.

Objectives

Objectives are derived from the outcomes and define the circumstances by which it will be known if the desired change has occurred. These objectives are precise in stating:

- expected change

- how the change should be manifested
- the expected level of change
- the time period over which the change is expected

Performance Criteria

Performance criteria are specific statements identifying level of performance required to meet the objectives. They are confirmable through evidence or indicators.

Evaluation

An outcome is a result of an activity such as an educational experience. The outcomes of a college education are the sum total of all knowledge, skills, and values developed over the course of the undergraduate experience, both inside and outside of class. Outcomes can be measured by developing statements that will help us determine if we have achieved the particular objectives and performance criteria for each outcome. These statements relate directly to evidence gathered through our assessment methods.

Outcome A: The Department of Chemical Engineering at the University of North Dakota will produce graduates who have an ability to apply knowledge of mathematics, science, and engineering.

Objective 1) Students will demonstrate the ability to apply mathematical, scientific, and engineering principles to both familiar and unfamiliar problems.

Performance Criteria: Student(s) will

1) Formulate appropriate solution strategies
2) Identify relevant principles, equations, and data
3) Systematically execute the solution strategy
4) Apply engineering judgment to evaluate answers

Evaluation:

Students will meet or exceed standards as set for each of the following assessment methods.

1. Senior Design Projects
    A. Peer Assessment
2. Portfolios
3. Nationally-normed Examination: Fundamentals of Engineering
4. Alumni Surveys
5. Employer/Recruiter Surveys
6. Placement Data/Exit Interviews
7. Course Evaluations
8. Co-op
    A. Supervisor Surveys
    B. Student Assessment

Objective 2) Our students and alumni will continue to demonstrate the ability to apply mathematical, scientific, and engineering principles to both familiar and unfamiliar problems beyond the classroom.

Performance Criteria: Student(s) will

1) Formulate appropriate solution strategies
2) Identify relevant principles, equations, and data
3) Systematically execute the solution strategy
4) Apply engineering judgment to evaluate answers

Evaluation:

Students will meet or exceed standards as set for each of the following assessment methods.

1. Senior Design Projects
    A. Peer Assessment
2. Portfolios
3. Nationally-normed Examination: Fundamentals of Engineering
4. Alumni Surveys
5. Employer/Recruiter Surveys
6. Placement Data/Exit Interviews
7. Course Evaluations

8. Co-op
    A. Supervisor Surveys
    B. Student Assessment

Outcome B: The Department of Chemical Engineering at the University of North Dakota will produce graduates who have an ability to design and conduct experiments, as well as to analyze and interpret data.

Objective 1) When working on tasks and assignments requiring the acquisition of experimental evidence or results, students will make appropriate measurements, record information in a meaningful format, perform the analyses necessary to relate system variables, and convey an interpretation of the results to an appropriate audience.

Performance Criteria: Student(s) will

1) Prepare a laboratory report with technical content appropriate to the audience
2) Present summarized results based on analysis of the measurements
3) Describe in sufficient detail the experimental procedure used in obtaining the measurements
4) Not include uninterpreted measurements as results
5) Apply proper laboratory techniques insuring the health and safety of themselves and the environment
6) Include an estimation of the error of their measurements

Objective 2) When working on tasks and assignments requiring the acquisition of experimental evidence or results, students will synthesize, based on the analysis of system variables, relationships between derived quantities.

Performance Criteria: Student(s) will

1) Describe synthesis results in the laboratory report
2) Demonstrate known relationships (or derive empirical relationships) between the analyzed quantities resulting from the measured variables

Objective 3) When assigned a task requiring experimental evidence, students will develop an experimental design that effectively uses limited resources while obtaining the necessary information.

Performance Criteria: Student(s) will

1) Identify all meaningful variables
2) Determine the relative importance of the variables
3) Decide how many variables are important by balancing the given resources and time with the needed information
4) Determine how to measure these variables
5) Analyze and synthesize the results to obtain the required information
6) Include statistically designed experiments when developing experiments

Evaluation:

Students will meet or exceed standards as set for each of the following assessment methods.

1. Senior Design Projects
    A. Peer Assessment
2. Portfolios
3. Alumni Surveys

4. Employer/Recruiter Surveys
5. Placement Data/Exit Interviews
6. Co-op
    A. Supervisor Surveys
    B. Student Assessment

Outcome C: The Department of Chemical Engineering at the University of North Dakota will produce graduates who have an ability to design a system, component, or process to meet desired needs.

Objective 1) Students will be able to select a component that is the appropriate size and type.
Performance Criteria: Student(s) will

1) Size and design different components that would be useful in carrying out process(es)

Objective 2) Students will be able to design a process consisting of operations that transform raw materials into desired products.
Performance Criteria: Student(s) will

1) apply fundamental principles of chemical engineering to problems involving mass and energy balances to reaction kinetics, thermodynamics, momentum and heat transfer, mass transfer, dynamics, and control of processes
2) Integrate design of various components into a process

Objective 3) Students will be able to design a system by grouping appropriate processes to transform raw materials into desired products.
Performance Criteria: Student(s) will

1) Integrate design of various components into a process, and various processes into a system
2) Conduct a market survey
3) Select an appropriate plant site for the system
4) Layout a plant
5) Select instrumentation
6) Conduct economic feasibility study

Evaluation:

Students will meet or exceed standards as set for each of the following assessment methods.

1. Senior Design Projects
    A. Faculty Assessment
    B. Peer Assessment
2. Alumni Surveys
3. Employer/Recruiter Surveys
4. Placement Data/Exit Interviews
5. Course Evaluations
6. Co-op
    A. Supervisor Surveys
    B. Student Assessment

Outcome D: The Department of Chemical Engineering at the University of North Dakota will produce graduates who have an ability to function on multi-disciplinary teams.

Objective 1) Through fundamental chemistry and physics laboratories, humanities courses, and extracurricular activities including Sunrayce, Skunkworks, and E-council, students will exhibit an ability to function on multi-disciplinary teams.

Performance Criteria: Student(s) will:

1) interact synergistically with people from other disciplines to achieve a common goal
2) utilize the different skills and abilities of their team members

Evaluation:

Students will meet or exceed standards as set for each of the following assessment methods.

1. Senior Design Projects
    A. Faculty Assessment
    B. Peer Assessment
2. Alumni Surveys
3. Employer/Recruiter Surveys
4. Placement Data/Exit Interviews
5. Co-op
    A. Supervisor Surveys
    B. Student Assessment

Outcome E: The Department of Chemical Engineering at the University of North Dakota will produce graduates who have an ability to identify, formulate, and solve engineering problems.

Objective 1) In classroom and laboratory activities, students will identify known variables, unknown variables, and the relationships between them.

Performance Criteria: Student(s) will:

1) Correctly formulate solutions and solve word problems on exams
2) Prepare adequate laboratory reports

Objective 2) In classroom and laboratory activities, students will be able to discern extraneous from essential information, and be able to identify when essential information is missing.

Performance Criteria: Student(s) will:

1) Correctly formulate solutions and solve word problems on exams
2) Prepare adequate laboratory reports

Objective 3) Students will be able to formulate and solve problems in technical areas or in technologies in which they have not received formal instruction.

Performance Criteria: Student(s) will:

1) Prepare adequate laboratory reports
2) Pass the Fundamentals of Engineering Exam

Objective 4) In all their engineering studies, students will be able to reflect on the reasonableness of their problem solutions.

Performance Criteria: Student(s) will:

1) Prepare adequate laboratory reports
2) Prepare adequate senior design reports

Evaluation:

Students will meet or exceed standards as set for each of the following assessment methods.

1. Senior Design Projects
    A. Faculty Assessment
    B. Peer Assessment
2. Portfolios
3. Nationally-normed Examination: Fundamentals of Engineering
4. Alumni Surveys
5. Employer/Recruiter Surveys
6. Placement Data/Exit Interviews
7. Course Evaluations
8. Co-op
    A. Supervisor Surveys
    B. Student Assessment

Outcome F: The Department of Chemical Engineering at the University of North Dakota will produce graduates who have an understanding of professional and ethical responsibility.

Objective 1) Upon completion of their degrees, students will take deep pride in the profession of chemical engineering and to it owe solemn obligations of integrity and high ethical principles in applying technology and engineering principles.

Performance Criteria: Student(s) will:

1) Demonstrate an understanding of the professional obligations such as those outlined in the order of the engineer ceremony
2) Practice integrity and fair dealing, tolerance and respect
3) Uphold devotion to the standards and the dignity of the profession of chemical engineering

Objective 2) When faced with an ethical dilemma, students will be able to link and apply reasoning strategies from the theories and principles of ethics and chemical engineering, and to take ethical responsibility by demonstrating an understanding of the limits of knowledge and safety.

Performance Criteria: Student(s) will:

1) Demonstrate an understanding of ethical issues in the field of chemical engineering
2) Demonstrate knowledge of engineering ethics codes
3) Demonstrate knowledge of ethics theory
4) Participate in none but honest enterprises
5) Make informed ethical choices

Evaluation:

Students will meet or exceed standards as set for each of the following assessment methods.

1. Senior Design Projects
    A. Peer Assessment
2. Nationally-normed Examination: Fundamentals of Engineering
3. Alumni Surveys
4. Employer/Recruiter Surveys
5. Placement Data/Exit Interviews
6. Co-op
    A. Supervisor Surveys
    B. Student Assessment

Outcome G: The Department of Chemical Engineering at the University of North Dakota will produce graduates who have an ability to communicate effectively.

Objective 1) Through multiple opportunities to speak formally and receive feedback when engaged in presenting a technical report to an audience of peers and faculty, the student will exhibit good speaking skills and good listening skills at a professional level.

Performance Criteria: Student(s) will:

1) provide an introduction that grabs attention and orients the audience
2) provide a body that is relevant, covers important points, and is complete
3) provide a summary with conclusions and recommendations
4) show enthusiasm
5) speak loud enough and clearly
6) use proper syntax and grammar
7) maintain eye contact and not read from notes
8) answer questions politely, accurately, and completely
9) use appropriate visual aids to communicate (neat, not too crowded, error-free)
10) give a presentation that is appropriate for the specified audience in terms of technical content
11) convey key points clearly and succinctly

Objective 2) Through multiple written assignments, by graduation, students will exhibit good written communication skills at a professional level.

Performance Criteria: Student(s) will:

1) provide an introduction that grabs attention and orients the reader
2) provide a body that is relevant, covers important points, and is complete
3) provide a summary with conclusions and recommendations
4) use proper syntax and grammar
5) write appropriately for the specified reader in terms of technical content
6) convey key points clearly and succinctly

Evaluation:

Students will meet or exceed standards as set for each of the following assessment methods.

1. Senior Design Projects
    A. Faculty Assessment
    B. Peer Assessment
2. Portfolios
3. Alumni Surveys
4. Employer/Recruiter Surveys
5. Placement Data/Exit Interviews
6. Co-op
    A. Supervisor Surveys
    B. Student Assessment

Outcome H: The Department of Chemical Engineering at the University of North Dakota will produce graduates who have the broad education necessary to understand the impact of engineering solutions in a global/societal context.

Objective 1) By taking a series of required general education courses and through discussion in chemical engineering classes, students will be aware of how the practice of chemical engineering impacts other disciplines and factors in society.

Performance Criteria: Student(s) will:

1) Demonstrate an understanding of energy and the environment as these areas relate to chemical engineering
2) Demonstrate an understanding of health and medicine as these areas relate to chemical engineering
3) Demonstrate an understanding of business and economics as these areas relate to chemical engineering
4) Demonstrate an understanding of government, law, and public/organizational policies as these areas relate to chemical engineering

Evaluation:

Students will meet or exceed standards as set for each of the following assessment methods.

1. Senior Design Projects
    A. Peer Assessment
2. Alumni Surveys
3. Employer/Recruiter Surveys
4. Placement Data/Exit Interviews
5. Co-op
    A. Supervisor Surveys
    B. Student Assessment

Outcome I: The Department of Chemical Engineering at the University of North Dakota will produce graduates who have a recognition of the need for and an ability to engage in life-long learning.

Objective 1) Students will have an awareness of the technical literature (journals, professional news magazines, trade publications, etc.) and have the ability to find desired information.

Performance Criteria: Alumni will:

1) Be actively engaged in any of the following: attending a continuing education program, attending a technical conference, registered for professional or technical membership (e.g., AIChE), or pursuing registration as a professional engineer

Objective 2) Students will utilize information and perspectives from archival and contemporary technical literature for open ended laboratory exercises and engineering design experiences.

Performance Criteria: Student(s) will:

1) Correctly compare experimental results to results published in the technical literature and is able to accurately describe the differences

Objective 3) Students will demonstrate that they are 'computer literate.'

Performance Criteria: Student(s) will:

1) Use a computer as a tool for completing assigned projects

Evaluation:

Students will meet or exceed standards as set for each of the following assessment methods.

1. Senior Design Projects
    A. Peer Assessment
2. Nationally-normed Examination: Fundamentals of Engineering
3. Alumni Surveys
4. Employer/Recruiter Surveys
5. Placement Data/Exit Interviews
6. Co-op
    A. Supervisor Surveys
    B. Student Assessment

Outcome J: The Department of Chemical Engineering at the University of North Dakota will produce graduates who have a knowledge of contemporary issues in the field of chemical engineering.

Objective 1) Students will have an awareness of the technical literature (journals, professional news magazines, trade publications, etc.) and have the ability to find desired information.

Performance Criteria: Alumni will:

1) Be actively engaged in any of the following: attending a continuing education program, attending a technical conference, registered for professional or technical membership (e.g., AIChE), or pursuing registration as a professional engineer

Objective 2) Students will utilize information and perspectives from archival and contemporary technical literature for open ended laboratory exercises and engineering design experiences.

Performance Criteria: Student(s) will:

1) Correctly compare experimental results to results published in the technical literature and are able to accurately describe the differences

Objective 3) Students will demonstrate that they are 'computer literate.'

Performance Criteria: Student(s) will:

1) Use a computer as a tool for completing assigned projects

Evaluation:

Students will meet or exceed standards as set for each of the following assessment methods.

1. Senior Design Projects
    A. Peer Assessment
2. Portfolios
3. Alumni Surveys
4. Employer/Recruiter Surveys
5. Placement Data/Exit Interviews
6. Course Evaluations
7. Co-op
    A. Supervisor Surveys
    B. Student Assessment

Outcome K: The Department of Chemical Engineering at the University of North Dakota will produce graduates who have an ability to use techniques, skills, and modern engineering tools necessary for engineering practice.

Objective 1) Through projects, assignments, and examinations, the student will be presented with the opportunity to use and develop the necessary problem solving techniques and skill to practice engineering at a professional level.

Performance Criteria: Student(s) will:

1) Students will apply fundamental principles of chemical engineering to problems involving mass and energy balances

Objective 2) The student will be able to use computers, appropriate software packages, and other modern engineering tools to aid the problem solving process.

Performance Criteria: Student(s) will:

1) Students will use word processors in writing reports, spreadsheets to perform calculations and present data in tabular and graphical form, and other tools to analyze and solve engineering problems

Evaluation:

Students will meet or exceed standards as set for each of the following assessment methods.

1. Senior Design Projects
    - A. Faculty Assessment
    - B. Peer Assessment
2. Portfolios
3. Alumni Surveys
4. Employer/Recruiter Surveys
5. Placement Data/Exit Interviews
6. Co-op
    - A. Supervisor Surveys
    - B. Student Assessment

Outcome L: The Department of Chemical Engineering at the University of North Dakota will produce graduates who have experience in undergraduate research and engineering in practice.

Objective 1) Through laboratory experiences and undergraduate research opportunities, students will gain experience in research principles and practices.

Performance Criteria: Student(s) will:

1) design and execute effective experimental or process simulation plans
2) identify and acquire necessary data
3) analyze and critically interpret results
4) form valid conclusions and make recommendations

Objective 2) Through coop experience, senior plant design and the undergraduate laboratory sequence students will gain experience in engineering in practice.

Performance Criteria: Student(s) will:

1) actively participate in the design of a chemical engineering plant involving a reactor and unit operations
2) utilize engineering equipment
3) evaluate solutions to complex engineering problems
4) interact synergistically in a professional capacity with other engineers

Evaluation:

Students will meet or exceed standards as set for each of the following assessment methods.

1. Senior Design Projects
    A. Faculty Assessment
    B. Peer Assessment
2. Alumni Surveys
3. Employer/Recruiter Surveys
4. Placement Data/Exit Interviews
5. Co-op
    A. Supervisor Surveys
    B. Student Assessment

Outcome M: The Department of Chemical Engineering at the University of North Dakota will produce graduates who have an understanding of the role of economics in engineering and an ability to apply that understanding to problem-solving.

Objective 1) Students and alumni will be able to determine the economic impact of engineering decisions and make recommendations based on this impact, even beyond the classroom.

Performance Criteria: Students(s) will

1) Demonstrate an awareness of economic factors
2) Calculate relevant economic parameters
3) Use accepted economic practice to evaluate alternatives
4) Make recommendations incorporating economics as an important criterion

Evaluation:

Students will meet or exceed standards as set for each of the following assessment methods.

1. Senior Design Projects
    A. Faculty Assessment
    B. Peer Assessment
2. Nationally-normed Exam: Fundamentals of Engineering
3. Alumni Surveys
4. Employer/Recruiter Surveys
5. Placement Data/Exit Interviews
6. Co-op
    A. Supervisor Surveys
    B. Student Assessment

Outcome N: The Department of Chemical Engineering at the University of North Dakota will produce graduates who have a working knowledge in organic, inorganic and physical chemistry and a background in other advanced chemistry topics as selected by the individual student.

Objective 1) Students will be conversant with the nomenclature commonly used to describe chemical compounds, reactions, operations and processes.

Performance Criteria: Student(s) will:

1) Solve homework and examination problems
2) Conduct laboratory exercises and prepare written reports
3) Complete the capstone design project

Objective 2) Students will be able to balance chemical equations, formulate and solve problems and conduct laboratory exercises, and prepare written materials that convey their background and knowledge of chemistry.

Performance Criteria: Student(s) will:

1) Solve homework and examination problems
2) Conduct laboratory exercises and prepare written reports
3) Complete the capstone design project

Evaluation:

1. Senior Design Projects
    A. Faculty Assessment
    B. Peer Assessment
2. Nationally-normed Exam: Fundamentals of Engineering
3. Alumni Surveys
4. Employer/Recruiter Surveys
5. Placement Data/Exit Interviews
6. Co-op
    A. Supervisor Surveys
    B. Student Assessment

4 Improvement Process

Once assessment has been conducted, the faculty will use this improvement process.

Step #1: Review assessment results. If an assessment result indicates that no change is required for practices related to a particular criterion, they will so document "no change required." If the faculty finds a deficiency in an indicator, they will proceed to step #2.

Step #2: The faculty will determine whether the indicators are accurate. If not, the faculty stop the improvement process and reassess or disregard the finding by indicating no change required. If the indicator is found to be accurate, proceed to step #3.

Step #3: The faculty will determine possible causes for a deficiency. Proceed to step #4.

Step #4: The faculty will determine the severity of a deficiency in terms of how serious it is and the scope (how many Outcomes are affected). Proceed to step #5.

Step #5: The faculty will select one or more of the following strategies depending on what was determined in the previous step.

Strategies:

* modify "unwritten" department policies or recommendations
* modify one or more assessment methods or instruments
* modify one or more Outcomes, objectives, performance criteria, or Evaluation
* modify a class or sequence of classes
* modify departmental policies
* modify professional development to include additional training
* modify faculty advising
* modify mission statement
* modify admissions policy
* modify faculty practice
* modify curriculum
* modify faculty workload
* modify number of faculty

5 Departmental Roles in Assessment Activities

The assessment coordinator is responsible for data collection. He will ensure that the data for the assessment tools are collected at the designated times and are properly stored. A typed summary and a statistical presentation of the data, if applicable, will be prepared for all data collected through assessment methods. All assessment data will be stored in file cabinets in room 314. Prior to the annual assessment period, the ABET coordinator will conduct a preliminary review of the data and be prepared to lead the rest of the group in an analytical discussion of those particular data.

Individual faculty are responsible for portfolios, senior design projects and course evaluations. Portfolios: The faculty members teaching Lab. IV, Kinetics, or Mass Transfer will collect the necessary samples (portfolios were discontinued for 2001-02). Senior Design Projects: The peer

assessment tool will be given to students during a plant design meeting period, and faculty will conduct the faculty assessment portion as part of their reading of the projects. Course evaluations: the department chair and faculty will review all course evaluations, and faculty who are teaching Unit Operations, Mass Transfer, Process Control, or Kinetics will ensure that the three additional assessment items are included. In addition, faculty will collect appropriate samples from senior design projects for the portfolios and ensure that the three additional assessment items are included in the course evaluations.

Administrative Assistant:
Assist coordinators with any duplicating, mailing, receiving or data entry of instruments

ABET Coordinator:
Nationally-normed Exam: Fundamentals of Engineering
Alumni Surveys
Employer Surveys

All Chemical Engineering Faculty:
Review Senior Design Projects
Coordinate Peer Assessment in Senior Design
Distribute three additional assessment items on Course Evaluations, if applicable

Chair:
New Student Surveys (now used as a recruiting tool)
Exit Interviews (Graduates and Non-Graduates)

Co-op Coordinator:
Co-op Supervisor Surveys and Co-op Student Assessment Reports

6 Timeline: Assessment Activities

The faculty has set aside time in May or June after the spring semester to review all assessment data from the year just completed (Summer, Fall, and Spring) and make any changes. The following is a schedule of data collection. If the outcomes are met or exceeded, the faculty may elect to stagger collection times in subsequent years. If an outcome is not met or if a change that impacts data collection is made, the regular schedule will be followed.

Summer Semester:

* (early) select samples for portfolios from Spring semester course, 412 Senior Design
* (middle) record spring FE exam results
* (middle) record course evaluations, including the three assessment questions for 306 Unit Operations and 412 Senior Design, from Spring semester; Review course evaluations on an individual basis and with department chair
* (late) survey alumni from 1 year (i.e., previous calendar year) and 3 years out (previous calendar minus two calendar years)
* (late) collect student placement/exit interview data from Summer graduates
* (late) collect co-op supervisor surveys and student written reports on co-op
* (late or when applicable) give recruiter/employer surveys to on-campus recruiters

Fall Semester:

* (early) administer new student survey
* (middle) record course evaluations from Summer semester; Review course evaluations on an individual basis and with department chair
* (late) administer 3 assessment questions as part of course evaluations in 405 Mass Transfer, 408 Process Control, and 421 Kinetics
* (late) collect student placement/exit data from December graduates
* (late) collect co-op supervisor surveys and student written reports on co-op
* (late or when applicable) give recruiter/employer surveys to on-campus recruiters

Spring Semester:

* (early) select samples for portfolios from Fall semester courses - 431 Lab IV, 421 Kinetics, and 405 Mass Transfer
* (middle) record course evaluations, including the 3 assessment questions for 405 Mass Transfer, 408 Process Control, and 421 Kinetics, from Fall semester; Review course evaluations on an individual basis and with department chair
* (middle) record fall FE exam results
* (late) administer 3 assessment questions as part of course evaluations in 306 Unit Operations and 412 Senior Design
* (late) collect student placement/exit data from Spring graduates
* (late) senior design assessment: peers
* (late) senior design assessment: faculty
* (late) collect co-op supervisor surveys and student written reports on co-op
- (late or when applicable) give recruiter/employer surveys to on-campus recruiters

7 Assessment Instruments

The instruments used as a part of the annual assessment are presented in this section.

Peer-Assessment for Senior Plant Design (ChE 412)

The Department of Chemical Engineering is gathering information as part of its on-going assessment plan. Please complete one of these sheets on each of your fellow team members and return the sheets in a sealed envelope to Fern Wood. You do not need to include your name or your team members= names on this form. All information will be kept confidential and will not impact anyone=s grade. Therefore, please give a thoughtful and honest assessment.

Please rate your team member on each of the following attributes on a scale from 1-5. Circle the number that best describes your assessment of your team member in these areas. If you cannot provide a rating, please leave the item blank. If you would like to provide any additional comments related to this team member or these attributes, please do so at the bottom or on the back of this form. Thank you!

1 - Poor 2 - Below Average 3 - Average 4 - Above Average 5 - Excellent

A. Ability to apply knowledge of mathematics, science and engineering	1	2	3	4	5
B. Ability to design and conduct experiments, as well as to analyze and interpret data	1	2	3	4	5
C. Ability to design a system, component, or process to meet desired needs	1	2	3	4	5
D. Ability to function on multi-disciplinary and/or diverse teams	1	2	3	4	5
E. Ability to identify, formulate, and solve engineering problems.....	1	2	3	4	5
F. Understanding of professional and ethical responsibility.....	1	2	3	4	5
G. Ability to communicate effectively	1	2	3	4	5
H. Understand the impact of engineering solutions in a global and societal context	1	2	3	4	5
I. Recognize the need for, and an ability to engage in life-long learning	1	2	3	4	5
J. Knowledge of contemporary issues of relevance to the field of Chemical Engineering	1	2	3	4	5
K. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.....	1	2	3	4	5
L. Experience in undergraduate research and engineering in practice	1	2	3	4	5
M. An understanding of the role of economics in engineering and an ability to apply that understanding to problem-solving	1	2	3	4	5
N. A thorough grounding in chemistry and engineering topics, including safety and environmental aspects	1	2	3	4	5

Comments:

Faculty Assessment Form for Senior Plant Design (ChE 412)

Team Name: _____ Date: _____
Project: _____

1=Unsatisfactory 2=Needs Improvement 3=Meets Standards 4=Exceeds Standards

Communication skills:
__ Mechanics (grammar, spelling, style, punctuation, use of references)
__ Appropriate for audience (detail, technical level)
__ Organization
__ Use of graphics (tables, diagrams, figures, pictures)

Content:
__Arguments and appropriate conclusions/recommendations
__Issues of health, safety, and the environment
__Meets project minimum criteria (two different separations, a chemical reaction, and necessary economic analysis)

Team=s demonstrated abilities:

C. Ability to design a system, component, or process to meet desired needs	1	2	3	4
D. Ability to function on multi-disciplinary and/or diverse teams	1	2	3	4
E. Ability to identify, formulate, and solve engineering problems	1	2	3	4
G. Ability to communicate effectively	1	2	3	4
K. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	1	2	3	4
L. Experience in undergraduate research and engineering in practice	1	2	3	4
M. An understanding of the role of economics in engineering and an ability to apply that understanding to problem-solving	1	2	3	4
N. A thorough grounding in chemistry and engineering topics, including safety and environmental aspects	1	2	3	4

The UND Department of Chemical Engineering -- Alumni Survey

The Department of Chemical Engineering is interested in gathering data about our graduates as part of our assessment plan. Please take a few minutes to complete this survey and return it in the postage paid envelope provided for you.

1. When did you graduate from UND? (month, year) _____

2. Please indicate your present status:

_____ Employed in engineering _____ Graduate student
_____ Employed, but not in engineering _____ Not employed and not a student

3. If employed, current job title: _____

4. If employed, current employer name: _____

5. If a graduate student, degree and field sought: _____

6. If a graduate student, graduate school name: _____

7. If employed as an engineer, check the types of engineering work you do:

_____ Research _____ Technical Support _____ Teaching
_____ Marketing _____ Training _____ Sales
_____ Development _____ Project Engineering_____ Manufacturing
_____ Management _____ Other: _____

8. If employed in engineering, how do you rate the quality of your educational preparation to be an engineer?

_____ Far higher than average
_____ Higher than average
_____ Average
_____ Lower than average
_____ Far lower than average

Using the following scale, please rate the following items 9-13 -- (1=weak to 5=strong)

9. Overall quality of your UND chemical engineering classes.	1	2	3	4	5
10. Overall quality of your UND chemical engineering laboratory sequence.	1	2	3	4	5
11. Overall quality of your UND general education classes.	1	2	3	4	5
12. Overall quality of the UND chemical engineering faculty.	1	2	3	4	5
13. If you participated in the co-op program, please rate the overall quality of your experience.	1	2	3	4	5

14. Please identify the area or areas of the chemical engineering curriculum that contributed **most** to your professional development.

15. Please identify the area or areas of the chemical engineering curriculum that contributed **least** to your professional development. Please indicate how you would modify these.

16. What could we have done to improve your educational experience?

17. Rate the following outcomes based on their importance to achieving your professional goals as well as our effectiveness at providing you with what you needed to demonstrate that you have these abilities.

1=Strongly Disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly Agree

Degree to which these criteria are important in achieving your professional goals.					Criteria	Degree to which your education provided you with the ability to:				
1	2	3	4	5	A. apply knowledge of mathematics, science, and engineering	1	2	3	4	5
1	2	3	4	5	B. design and conduct experiments and analyze and interpret data	1	2	3	4	5
1	2	3	4	5	C. design a system, process, or component to meet desired needs	1	2	3	4	5
1	2	3	4	5	D. function on multi-disciplinary and/or diverse teams	1	2	3	4	5
1	2	3	4	5	E. identify, formulate, and solve engineering problems	1	2	3	4	5
1	2	3	4	5	F. understand professional and ethical responsibilities	1	2	3	4	5
1	2	3	4	5	G. communicate effectively	1	2	3	4	5
1	2	3	4	5	H. understand the impact of engineering solutions in a global/societal context	1	2	3	4	5
1	2	3	4	5	I. engage in lifelong learning	1	2	3	4	5
1	2	3	4	5	J. know about contemporary issues of relevance to the field of chemical engineering	1	2	3	4	5
1	2	3	4	5	K. use the techniques, skills and modern engineering tools necessary for engineering practice	1	2	3	4	5
1	2	3	4	5	L. engage in undergraduate research and engineering in practice	1	2	3	4	5
1	2	3	4	5	M. understand the role of economics in engineering and an ability to apply that understanding to problem-solving	1	2	3	4	5
1	2	3	4	5	N. understand chemistry and engineering topics, including safety and environmental aspects	1	2	3	4	5

Dear Recruiter/Employer:

The Department of Chemical Engineering at the University of North Dakota is gathering information for outcomes assessment. An important part of this assessment is how our stakeholders view our graduates. When completing this form, the first column is how you view our department=s graduates, and the second column is used to rate the importance of an issue to your company. Please provide any additional comments below or on the back. Thank you.

1. What is the primary reason you/your company decided to recruit/hire graduates from this department?

2. Please rate these criteria	Graduate Demonstration of 1 = Poor 5 = Excellent	Employer Rated Significance 1 = Low 5 = High
A. Ability to apply knowledge of math, science and engineering	1------- 2------- 3------- 4-------5	1------- 2------- 3------- 4-------5
B. Ability to design and conduct experiments, and analyze and interpret data.	1------- 2------- 3------- 4-------5	1------- 2------- 3------- 4-------5
C. Ability to design a system, component, or process to meet desired needs.	1------- 2------- 3------- 4-------5	1------- 2------- 3------- 4-------5
D. Ability to function on multi-disciplinary and/or diverse teams.	1------- 2------- 3------- 4-------5	1------- 2------- 3------- 4-------5
E. Ability to identify, formulate, and solve engineering problems.	1------- 2------- 3------- 4-------5	1------- 2------- 3------- 4-------5
F. Understanding of professional and ethical responsibility.	1------- 2------- 3------- 4-------5	1------- 2------- 3------- 4-------5
G. Ability to communicate effectively.	1------- 2------- 3------- 4-------5	1------- 2------- 3------- 4-------5
H. Education necessary to understand the impact of engineering solutions in a global and societal context.	1------- 2------- 3------- 4-------5	1------- 2------- 3------- 4-------5
I. Ability to engage in life-long learning.	1------- 2------- 3------- 4-------5	1------- 2------- 3------- 4-------5
J. Knowledge of contemporary issues of relevance to the field of Chemical Engineering.	1------- 2------- 3------- 4-------5	1------- 2------- 3------- 4-------5
K. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	1------- 2------- 3------- 4-------5	1------- 2------- 3------- 4-------5
L. Experience in undergraduate research and engineering in practice.	1------- 2------- 3------- 4-------5	1------- 2------- 3------- 4-------5
M. An understanding of the role of economics in engineering and an ability to apply that understanding to problem-solving.	1------- 2------- 3------- 4-------5	1------- 2------- 3------- 4-------5
N. A thorough grounding in chemistry and engineering topics, including safety and environmental aspects.	1------- 2------- 3------- 4-------5	1------- 2------- 3------- 4-------5

Comments:

UND Chemical Engineering Department
Exit Survefor Graduates

The Chemical Engineering Department is interested in gathering placement/exit data about our graduates as part of our assessment plan. Please take a few minutes to complete this survey. You may write additional comments on the back of these sheets. We may send you an alumni survey within a year to follow up on your status.

Graduation date (please circle one): May August December
Graduation year: _____

Name: _____

Address: _____
_____
_____
_____

Phone number: _____

1. If you applied for a job or jobs:
   A. How many employers offered you an interview? _____
   B. How many plant trips did you get? _____
   C. How many job offers did you receive? _____

2. If you decided to accept a job offer, please answer A, B, C, and D. If not, go to #3.
   A. Name of employer: _____
   B. Type of industry:_____
   C. Job title: _____
   D. Please indicate your starting salary: _____

For questions 3 through 8, use the following scale 1=weak to 5=strong

3. Satisfaction with the advisement you received from UND chemical engineering Faculty.	1	2	3	4	5
4. Overall quality of your UND chemical engineering classes.	1	2	3	4	5
5. Overall quality of the UND chemical engineering laboratory sequence.	1	2	3	4	5
6. Overall quality of your UND general education classes.	1	2	3	4	5
7. Overall quality of the UND chemical engineering faculty.	1	2	3	4	5
8. If you participated in the co-op program, please rate the overall quality of your experience.	1	2	3	4	5

9. Please identify the area or areas of the chemical engineering curriculum that contributed **most** to your professional development.

10. What could we have done to improve your education?

11. Rate the following outcomes based on their importance to achieving your professional goals as well as our effectiveness at providing you with what you needed to demonstrate that you have these abilities.

1=Strongly Disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly Agree

Degree to which these criteria will be important in achieving your professional goals.					Criteria	Degree to which your education provided you with the ability to:				
1	2	3	4	5	A. apply knowledge of mathematics, science, and engineering	1	2	3	4	5
1	2	3	4	5	B. design and conduct experiments and analyze and interpret data	1	2	3	4	5
1	2	3	4	5	C. design a system, process, or component to meet desired needs	1	2	3	4	5
1	2	3	4	5	D. function on multi-disciplinary and/or diverse teams	1	2	3	4	5
1	2	3	4	5	E. identify, formulate, and solve engineering problems	1	2	3	4	5
1	2	3	4	5	F. understand professional and ethical responsibilities	1	2	3	4	5
1	2	3	4	5	G. communicate effectively	1	2	3	4	5
1	2	3	4	5	H. understand the impact of engineering solutions in a global/societal context	1	2	3	4	5
1	2	3	4	5	I. engage in lifelong learning	1	2	3	4	5
1	2	3	4	5	J. know about contemporary issues of relevance to the field of chemical engineering	1	2	3	4	5
1	2	3	4	5	K. use the techniques, skills and modern engineering tools necessary for engineering practice	1	2	3	4	5
1	2	3	4	5	L. engage in undergraduate research and engineering in practice	1	2	3	4	5
1	2	3	4	5	M. understand the role of economics in engineering and an ability to apply that understanding to problem-solving	1	2	3	4	5
1	2	3	4	5	N. understand chemistry and engineering topics, including safety and environmental aspects	1	2	3	4	5

Attachment to Course Evaluations
for
ChE 306 Unit Operations
ChE 405 Mass Transfer
ChE 408 Process Control
ChE 412 Senior Plant Design
ChE 421 Reactor Design (Kinetics)

This department is gathering information as part of its on-going assessment plan. As you are completing your course evaluation for one of the courses listed above, please also rate the following three items on the form. These items will serve as numbers 18, 19, and 20 on your form. Please use the same rating scale as is indicated on your form.

(SA=Strongly Agree, A=Agree, N=Neutral, D=Disagree, SD=Strongly Disagree)

18. This course contributed to my ability to apply knowledge of mathematics, science and engineering

19. This course contributed to my ability to design a system, component, or process to meet desired needs

20. This course contributed to my ability to identify, formulate, and solve engineering problems

Dear Co-op Supervisor:

The Department of Chemical Engineering at the University of North Dakota is interested in gathering data about our graduates as part of our assessment plan. Please take a few minutes to complete this survey. You may write any additional comments on the back of this sheet. Please return this sheet at the end of the term. Thank you!

Please rate the following outcomes based on their importance to your company=s goals or needs as well as how well the student assigned to you demonstrated these abilities. If the item is not applicable, please leave it blank.

1=Strongly Disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly Agree

Degree to which these criteria are important in achieving your company=s goals.	Criteria	Degree to which your UND Chemical Engineering student demonstrated the ability to:
1 2 3 4 5	A. apply knowledge of mathematics, science, and engineering	1 2 3 4 5
1 2 3 4 5	B. design and conduct experiments and analyze and interpret data	1 2 3 4 5
1 2 3 4 5	C. design a system, process, or component to meet desired needs	1 2 3 4 5
1 2 3 4 5	D. function on multi-disciplinary and/or diverse teams	1 2 3 4 5
1 2 3 4 5	E. identify, formulate, and solve engineering problems	1 2 3 4 5
1 2 3 4 5	F. understand professional and ethical responsibilities	1 2 3 4 5
1 2 3 4 5	G. communicate effectively	1 2 3 4 5
1 2 3 4 5	H. understand the impact of engineering solutions in a global/societal context	1 2 3 4 5
1 2 3 4 5	I. engage in lifelong learning	1 2 3 4 5
1 2 3 4 5	J. know about contemporary issues of relevance to the field of chemical engineering	1 2 3 4 5
1 2 3 4 5	K. use the techniques, skills and modern engineering tools necessary for engineering practice	1 2 3 4 5
1 2 3 4 5	L. engage in undergraduate research and engineering in practice	1 2 3 4 5
1 2 3 4 5	M. understand the role of economics in engineering and an ability to apply that understanding to problem-solving	1 2 3 4 5
1 2 3 4 5	N. understand chemistry and engineering topics, including safety and environmental aspects	1 2 3 4 5