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Degree Program
Assessment of Student Learning Plan
Kansas State University

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

A. College, Department, and Date

College: Engineering
Department: Mechanical and Nuclear Engineering
Date: November 10, 2004

B. Contact Person(s) for the Assessment Plans

Dr. Jack Xin, Associate Professor
Dr. Mo Hosni, Professor and Department Head

C. Degree Program

Bachelor of Science degree in Mechanical Engineering (BS in Mechanical Engineering)

D. Assessment of Student Learning Three-Year Plan

1. Student Learning Outcome(s)

Of the twelve Student Learning Outcomes (a) to (l) developed and approved by the MNE Faculty (3/4/2004), the department will focus on the following five student learning outcomes during our initial 3-year assessment plan.

Graduates of the Mechanical and Nuclear Engineering Department, with a B.S. degree in Mechanical Engineering, will have:

a. an ability to apply knowledge of mathematics (through multivariate calculus and differential equations, statistics, and linear algebra), science (including chemistry and calculus-based physics with depth in one), and engineering.
e. an ability to identify, formulate, and solve engineering problems.
f. an understanding of professional and ethical responsibility.
g. an ability to communicate effectively.
h. the broad education necessary to understand the impact of engineering solutions in a global and societal context.

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

	University-wide SLOs (Undergraduate Programs)					Program SLO is conceptually different from university SLOs
Program SLOs	Knowledge	Critical Thinking	Communication	Diversity	Academic / Professional Integrity	
a. an ability to apply knowledge of mathematics (through multivariate calculus and differential equations, statistics, and linear algebra), science (including chemistry and calculus-based physics with depth in one), and engineering	X					
e. an ability to identify, formulate, and solve engineering problems	X	X				
f. an understanding of professional and ethical responsibility				X	X	
g. an ability to communicate effectively			X			
h. the broad education necessary to understand the impact of engineering solutions in a global and societal context	X	X		X	X	

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

Multiple measures are used to assess the student learning outcomes listed in section D-1. These include (1) Student grades in courses; (2) Senior Exit Interview Responses to Courses; (3) Department Alumni/Employer Survey; (4) Fundamentals of Engineering Examination Subject Specific Results; (5) Percent Passing Fundamentals of Engineering Examination; (6) Faculty Course Reports (a sample of course report is shown in Attachment 4); and (7) Senior Design Report. Even though not all measures are used to assess every outcome, multiple measures including both direct measures (which are direct observations or examinations of student performance) and indirect measures (which are perceptions of student performance) are used for each outcome. The measures and the related goals are summarized in Attachment 1 (Measures and Goals for Outcomes) towards the end of this document.

Outcome (a)
An ability to apply knowledge of mathematics (through multivariate calculus and differential equations, statistics, and linear algebra), science (including chemistry and calculus-based physics with depth in one), and engineering

The following measures will be used to assess outcome (a):

Direct

- Fundamentals of Engineering Examination Subject Results (Chemistry, Dynamics, Electrical Circuits, Fluid Mechanics, Material Science/Strength of Materials, Mathematics, Mechanics of Materials, Statics, Thermodynamics)
- Percent Passing Fundamentals of Engineering Examination
- Course Grades
- Senior Design Report Question: The team members have demonstrated an ability to apply knowledge of mathematics, science, and engineering.

Indirect

- Alumni Survey Question: He/She appears adequately prepared and proficient in the application of mathematics, science, and statistical analysis to his/her assignments.
- Senior Exit Interviews
- Course Report Group Evaluation

More details about the measures and the related goals are given in Attachment 1.

Outcome (e)
An ability to identify, formulate, and solve engineering problems

The following measures will be used to assess outcome (e):

Direct

- Fundamentals of Engineering Examination Subject Results (Dynamics, Electrical Circuits, Fluid Mechanics, Material Science/Strength of Materials, Mechanics of Materials, Statics, Thermodynamics)
- Percent Passing Fundamentals of Engineering Examination

- Course Grades
- Senior Design Report Question: The team members have demonstrated an ability to identify, formulate, and solve an engineering problem.

Indirect

- Alumni Survey Question: He/She appears adequately trained to recognize, identify, formulate and solve engineering problems.
- Senior Exit Interviews
- Course Report Group Evaluation

More details about the measures and the related goals are given in Attachment 1.

Outcome (f)
An understanding of professional and ethical responsibility

The following measures will be used to assess outcome (f):

Direct

- Fundamentals of Engineering Examination Subject Results: Ethics
- Course grades
- Senior Design Report Question: The team members have demonstrated ethical responsibility.

Indirect

- Alumni Survey Question: He/She was thoroughly prepared to understand and appreciate his/her responsibilities to conduct all duties in a professional and ethical manner.
- Senior Exit Interviews
- Course Report Group Evaluation

More details about the measures and the related goals are given in Attachment 1.

Outcome (g)
An ability to communicate effectively

The following measures will be used to assess outcome (g):

Direct

- Course Grades
- Senior Design Report Question: The team members have demonstrated an ability to communicate effectively.

Indirect

- Alumni Survey Question: He/She was effectively trained to have strong capabilities in oral and written communications.
- Senior Exit Interviews
- Course Report Group Evaluation

More details about the measures and the related goals are given in Attachment 1.

Outcome (h)
The broad education necessary to understand the impact of engineering solutions in a global and societal context

The following measures will be used to assess outcome (h):

Direct

- Course Grades

Indirect

- Alumni Survey Question: He/She was trained to be sensitive to how his/her engineering solutions might affect global and societal norms and needs.
- Senior Exit Interviews
- Course Report Group Evaluation

More details about the measures and the related goals are given in Attachment 1.

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

An assessment and evaluation process aiming at continuous improvement of our program has been in place that consists of two data collection-evaluation-feedback cycles. The first is a 1-year Course/Activity Evaluation cycle in which results from various measures will be collected and analyzed yearly. The results will be used determined how well the goals for the learning outcomes are achieved, and the feedback will be used to identify areas of strength and areas of weakness that needs improvement. The second is a 3-year Program Evaluation Review Process cycle in which the assessment and evaluation process is analyzed to determine whether the outcomes are aligned with the mission and educational objectives of the department, whether measures being used are effective and indicative of student learning outcomes, and whether the goals are reasonable and achievable. The two-cycle process is illustrated in Attachment 2: Assessment and Evaluation Process.

The format and timeline for the assessment process are shown in Attachment 3: Procedures and Timeline for Assessment and Evaluation Process. The procedures are summarized as follows:

Procedures on 1-year Course/Activity Evaluation Cycle

1. The processes in this cycle are completed annually. It is the primary mechanism for improvement of the program using assessment. The assessment data is collected throughout the year from several sources. The Undergraduate Committee (UGC) is responsible for summarizing the data and presenting it to the faculty. It is also responsible for developing initiatives and making recommendations to the faculty groups to improve the program based on this data. The faculty is responsible for making small modifications to improve courses, making recommendations to the UGC, assisting in the collection of some data, and implementing approved initiatives.
2. The course reporting activity serves many purposes beyond the collection of assessment data. Through the group course reports the faculty have a formal mechanism of recommending initiatives and modifications to the UGC and identifying problems that are outside of the scope of their courses. They also have a mechanism of reporting small modifications that do not require a faculty vote. Furthermore the course reports are a tool used in tracking and documenting the effectiveness of initiatives and modifications.
3. Based on all assessment data, initiatives, and modifications the UGC annually documents progress and summarizes assessment data.
4. There is a mechanism within this cycle to modify the relationship among courses/activities and program outcomes through a faculty vote. This is necessary due to occasional modifications to the curriculum and due to initiatives that may change these relationships.
5. The UGC is primarily responsible for executing the processes in this cycle, although all departmental faculty are included in the activities in many ways.

Procedures on Program Evaluation Review Cycle

1. At a minimum the processes in this cycle are completed every three years. This includes a complete evaluation of the entire program by the UGC with faculty involvement and a vote to approve or re-approve the departmental document defining relationships among courses/activities and outcomes and the document defining measures and performance metrics. This cycle is tightly coupled with the process for establishing the educational objectives and outcomes of the department.

The assessment plan applies to all 5 targeted outcomes.

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

The assessment and evaluation process established in the MNE Department is built on the concept of focusing on student learning and the notion of continuous improvement. The plan for improving student learning is fully embedded in the assessment and evaluation process illustrated in Attachment 3, and can be briefly summarized as follows:

1. The assessment data is collected throughout the year. The Undergraduate Committee (UGC) is responsible for summarizing the data and presenting it to the faculty. It is also responsible for developing initiatives and making recommendations to the faculty groups to improve the program based on this data. The faculty is responsible for making small modifications to improve courses, making recommendations to the UGC, assisting in the collection of some data, and implementing approved initiatives.
2. Based on all assessment data, initiatives, and modifications the UGC annually documents progress and summarizes assessment data.
3. There is a mechanism within the annual assessment cycle to modify the relationship among courses/activities and program outcomes through a faculty vote. This is necessary due to occasional modifications to the curriculum and due to initiatives that may change these relationships.
4. The UGC is primarily responsible for executing the assessment and evaluation processes, although all departmental faculty are included in the activities in many ways.

The improvement plan applies to all 5 targeted outcomes.

Attachment 1: Measures and Goals for Outcomes

Outcome / Measure	Goal
a. an ability to apply mathematics (through multivariate calculus and differential equations, statistics, and linear algebra), science (including chemistry and calculus-based physics with one in depth), and engineering	
Alumni Survey Question He/She appears adequately prepared and proficient in the application of mathematics, science, and statistical analysis to his/her assignments.	Goal: 3 5-strongly agree 1-strongly disagree
Fundamentals of Engineering Examination Subject Results Percent Passing Fundamentals of Engineering Examination Chemistry Dynamics Electrical Circuits Fluid Mechanics Material Science/Strength of Materials Mathematics Mechanics of Materials Statics Thermodynamics	Subject Goal: 2%+* Passing Goal: 90%
Course Grades Senior Exit Interviews Course Report Group Evaluation CHM 210 Chemistry I PHYS 213 Engineering Physics I PHYS 214 Engineering Physics II MATH 220 Analytic Geometry and Calculus I MATH 221 Analytic Geometry and Calculus II MATH 222 Analytic Geometry and Calculus III MATH 240 Elementary Differential Equations ME 512 Dynamics ME 513 Thermodynamics I ME 533 Machine Design I CE 533 Mechanics of Materials MATH 551 Applied Matrix Theory ME 570 Control of Mechanical Systems I ME 571 Fluid Mechanics ME 573 Heat Transfer	Grades Goal: 2.5 GPA Interview Goal: 70%@ Course Report Goal: 3 (MNE courses only)
Senior Design Report The team members have demonstrated an ability to apply knowledge of mathematics, science, and engineering.	Goal: 3 5-strongly agree 1-strongly disagree
e. an ability to identify, formulate, and solve engineering problems	
Alumni Survey Question He/She appears adequately trained to recognize, identify, formulate and solve engineering problems.	Goal: 3 5-strongly agree 1-strongly disagree

	Fundamentals of Engineering Examination Subject Results Percent Passing Fundamentals of Engineering Examination Dynamics Electrical Circuits Fluid Mechanics Material Science/Strength of Materials Mechanics of Materials Statics Thermodynamics	Subject Goal: 2%+* Passing Goal: 90%
	Course Grades Senior Exit Interviews Course Report Group Evaluation ME 101 Introduction to Mechanical Engineering ME 212 Engineering Graphics CHE 352 Structural Materials CE 333 Statics ME 400 Computer Apps in Mech Engineering NE 495 Elements of Nuclear Engineering ME 512 Dynamics ME 513 Thermodynamics I IMSE 530 Engineering Economic Analysis CE 533 Mechanics of Materials ME 533 Machine Design I ME 535 Measurement and Instrumentation Lab ME 570 Control of Mechanical Systems I ME 571 Fluid Mechanics ME 573 Heat Transfer ME 574 Interdisciplinary Industrial Design Projects I ME 575 Interdisciplinary Industrial Design Projects II	Grades Goal: 2.5 GPA Interview Goal: 70%@ Course Report Goal: 3 (MNE courses only)
	Senior Design Report The team members have demonstrated an ability to identify, formulate, and solve an engineering problem.	Goal: 3 5-strongly agree 1-strongly disagree
f. an understanding of professional and ethical responsibility		
	Alumni Survey Question He/She was thoroughly prepared to understand and appreciate his/her responsibilities to conduct all duties in a professional and ethical manner.	Goal: 3 5-strongly agree 1-strongly disagree
	Fundamentals of Engineering Examination Subject Results Ethics	Goal: 2%+*
	Course grades Senior Exit Interviews Course Report Group Evaluation ME 101 Introduction to Mechanical Engineering ME 574 Interdisciplinary Industrial Design Projects I ME 575 Interdisciplinary Industrial Design Projects II	Grades Goal: 2.5 GPA Interview Goal: 70%@ Course Report Goal: 3
	Senior Design Report The team members have demonstrated ethical responsibility.	Goal: 3 5-strongly agree

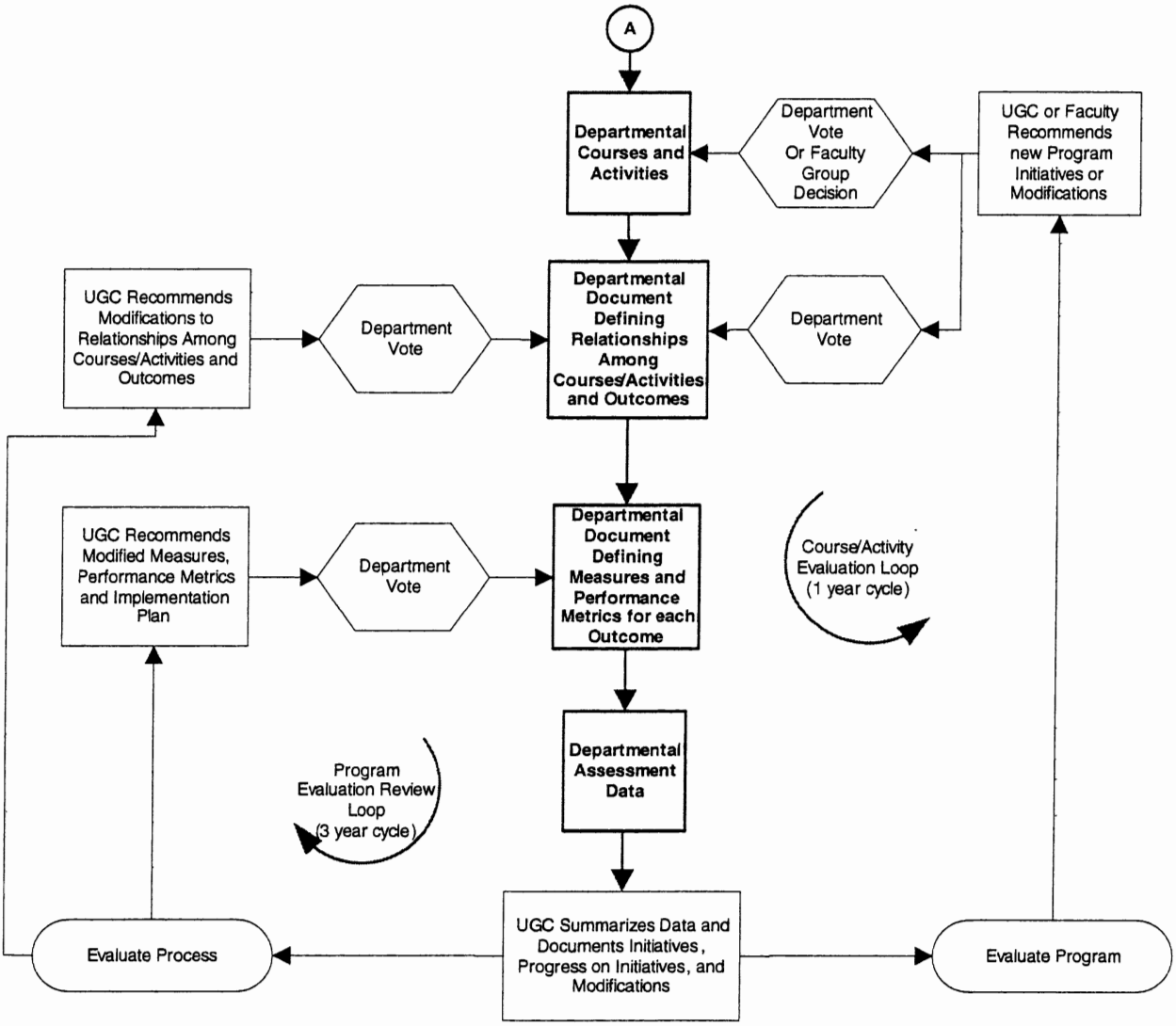
		1-strongly disagree
g. an ability to communicate effectively		
	Alumni Survey Question He/She was effectively trained to have strong capabilities in oral and written communications.	Goal: 3 5-strongly agree 1-strongly disagree
	Course Grades Senior Exit Interviews Course Report Group Evaluation ENGL 100 Expository Writing I SPCH 105 Public Speaking IA ENGL 415 Written Communication for Engineers ME 574 Interdisciplinary Industrial Design Projects I ME 575 Interdisciplinary Industrial Design Projects II	Grades Goal: 2.5 GPA Interview Goal: 70%@ Course Report Goal: 3 (MNE courses only)
	Senior Design Report The team members have demonstrated an ability to communicate effectively.	Goal: 3 5-strongly agree 1-strongly disagree
h. the broad education necessary to understand the impact of engineering solutions in a global and societal context		
	Alumni Survey Question He/She was trained to be sensitive to how his/her engineering solutions might affect global and societal norms and needs.	Goal: 3 5-strongly agree 1-strongly disagree
	Course Grades Senior Exit Interviews Course Report Group Evaluation UGE Required Courses IMSE 530 Engineering Economic Analysis ME 574 Interdisciplinary Industrial Design Projects I ME 575 Interdisciplinary Industrial Design Projects II Humanities or Social Science Electives	Grades Goal: 2.5 GPA Interview Goal: 70%@ Course Report Goal: 3 (MNE courses only)

* 2%+ indicates two percentage points above average of Carnegie Doctoral/Research Universities—Extensive.

@ Senior Exit Interviews Questions 4 and 5 Goal is 70%, with 100% being Excellent.

Attachment 2: Assessment and Evaluation Process

Course/Activity Evaluation (1 year cycle) and Program Evaluation Review Process (3 year cycle) Activities



Attachment 3: Procedures and Timeline for Assessment and Evaluation Process

Procedural Comments on Course/Activities Evaluation Cycle

1. The processes in this cycle are completed annually. It is the primary mechanism for improvement of the program using assessment. The timeline below helps to explain the systematic process for completing this cycle. The assessment data is collected throughout the year from several sources. The Undergraduate Committee (UGC) is responsible for summarizing the data and presenting it to the faculty. It is also responsible for developing initiatives and making recommendations to the faculty groups to improve the program based on this data. The faculty is responsible for making small modifications to improve courses, making recommendations to the UGC, assisting in the collection of some data, and implementing approved initiatives.

2. The course reporting activity serves many purposes beyond the collection of assessment data. Through the group course reports the faculty have a formal mechanism of recommending initiatives and modifications to the UGC and identifying problems that are outside of the scope of their courses. They also have a mechanism of reporting small modifications that do not require a faculty vote. Furthermore the course reports are a tool used in tracking and documenting the effectiveness of initiatives and modifications.

3. Based on all assessment data, initiatives, and modifications the UGC annually documents progress and summarizes assessment data.

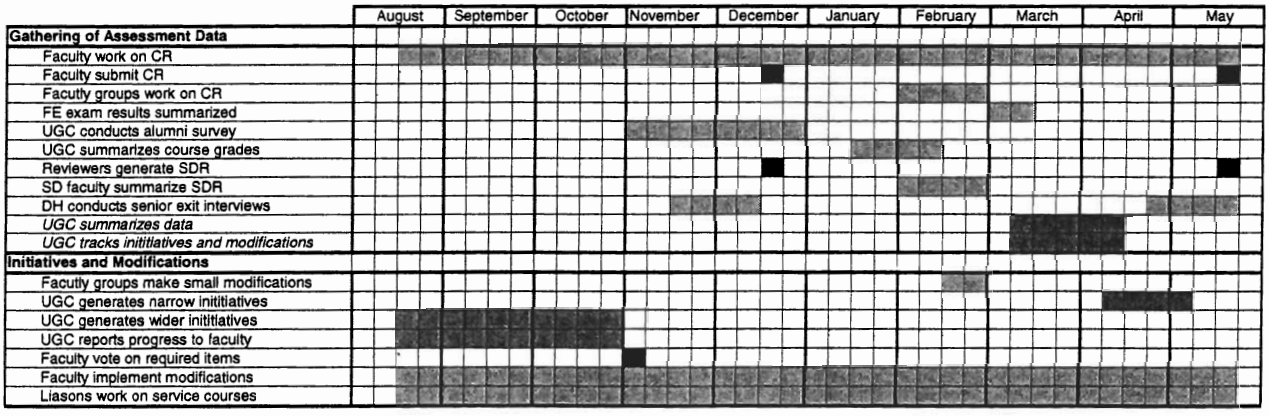
4. There is a mechanism within this cycle to modify the relationship among courses/activities and program outcomes through a faculty vote. This is necessary due to occasional modifications to the curriculum and due to initiatives that may change these relationships.

5. The UGC is primarily responsible for executing the processes in this cycle, although all departmental faculty are included in the activities in many ways.

Procedural Comments on Program Evaluation Review Cycle

1. At a minimum the processes in this cycle are completed every three years. This includes a complete evaluation of the entire program by the UGC with faculty involvement and a vote to approve or re-approve the departmental document defining relationships among courses/activities and outcomes and the document defining measures and performance metrics. This cycle is tightly coupled with the process for establishing objectives and outcomes. These activities take place in the timeline under the category of "UGC generates wider initiatives."

Annual Timeline for Assessment, Inititiatives, and Modifications



CR = Course Reports
FE = Fundamentals of Engineering
UGC = Undergraduate Committee
SD = Senior Design
SDR = Senior Design Reports
DH = Department Head

Attachment 4: Course Reports and Team Reports for Assessment

The Process for the Assessment Loop(s) Using the Reports

- Faculty complete course reports for each undergraduate course taught.
  - The attachments for the course reports should evolve to include examples of student work for specific outcomes as the next review approaches. ABET recommends that the examples of student work for the review of evaluators be organized according to outcomes. Our current process of compiling course notebooks really comes from the old ABET process and does not do this.

- Teams meet each year to complete team reports.
  - The discussion of the changes made and the strengths will be important for two reasons: 1) It will provide evidence of "closing the loop" for accreditation. 2) It will give us the opportunity to evaluate what other faculty are doing that either works or does not work.

- For each course, assessment values are assigned by the teams for each relevant outcome. The course and outcome linkage document will be used to find an average assessment value for each outcome. These values will be included in departmental assessment document.
  - We have to do something like this. It may seem hokey, but we must provide quantitative data and assign metric goals for assessment.

- The undergraduate committee evaluates team reports and assessment values to identify proposed changes at the program level and actions for courses outside the control of the MNE department.

- Loops are closed at several levels. However, documentation of this comes mainly from the team reports.
  - Faculty evaluate the effectiveness of a course every semester and implement improvements.
  - Faculty groups evaluate the effectiveness of a set of courses annually, implement improvements, and make recommendations to the entire faculty through the undergraduate committee for changes that require faculty approval and/or involvement of people outside of the department.
  - The undergraduate committee makes program level changes, recommends course level changes to the groups, and attempts to address issues outside of the control of the department.

Format of Faculty Course Report

Course:_____ Semester: _____ Instructor: _____

Numerical Assessment
1 - Unsatisfactory
2 - Needs improvement
3 – Satisfactory
4 – Good
5 – Excellent
N/A – Not applicable to this course

Using the scale above, assign an assessment value to each of the outcomes based on the student preparedness for this course.

Outcome	a	b	c	d	e	f	g	h	i	j	k	l1	l2
Assessment	*2*	*4*	*3*	*N/A*	*3*	*N/A*	*N/A*	*2*	*3*	*3*	*4*	*N/A*	*3*

Using the scale above, assign an assessment value to each of the outcomes based on the student performance in this course.

Outcome	a	b	c	d	e	f	g	h	i	j	k	l1	l2
Assessment	*2*	*4*	*3*	*N/A*	*3*	*N/A*	*N/A*	*2*	*3*	*3*	*4*	*N/A*	*3*

List of tools used in assigning assessment values for this course
Examples – These will evolve as faculty develops the process through implementation.

- *Notes taken after each exam that pertain to student progress on outcomes related to the course.*
- *Interaction with students in the laboratories.*
- *Discussions with the TA responsible for grading the labs and homework.*
- ***Etc…***

List attachments
Examples – These will evolve as faculty develops the process through implementation.

- *Notes about student performance made by the instructor on copies of exams. These are not necessarily comments on any one students exam, but rather general notes about the performance of the students related to specific outcomes.*
- *For future ABET evaluations, in the year previous to a review attachments should be collected for examples of student work demonstrating achievement of outcomes. This will replace the course notebooks. The materials for review by the visitors will organized according to outcomes rather than according to courses.*

Format of Team Reports

Course Assessment Values (one table for each course)

Course:_____

Outcome	a	b	c	d	e	f	g	h	i	j	k	l1	l2
Assessment	*2*	*4*	*3*	*N/A*	*3*	*N/A*	*N/A*	*2*	*3*	*3*	*4*	*N/A*	*3*

Discussion of Problems with Courses and Proposed Corrective Actions (At a minimum, explain the problem and discuss possible corrective actions for any outcome assigned a value of 2 or less in the course assessments.)

Discussion of Problems with Student Preparedness and/or Curriculum Issues
(To aid the undergraduate committee, discuss any perceived problems with prerequisite material or how the courses fit into the MNE curriculum.)

Discussion of Corrective Actions Taken (Discuss changes in sets of courses, changes in individual courses, and any other changes that can be evaluated in the current cycle. These changes may be the result of the team evaluations or the result of changes made at the curriculum level.)

Discussion of Strengths (If there are some things that are working particularly well in the courses or a particular course, and might be beneficial to the entire faculty, describe them.)