CRITERION 4. CONTINUOUS IMPROVEMENT

A. Program Educational Objectives

Assessment Process

Every three year the department administers alumni survey to determine the degree to which the PEOs are being attained. The department also reviews the PEOs with the DAC members every three years. Based upon the evaluation of the survey results and DAC feedback the department then takes the necessary action of either revising/modifying the PEO(s) or implementing appropriate changes in the program.

Evaluation process involves summarizing the survey results both numerically as well as qualitatively. The ISE faculty meets to discuss the results and makes necessary recommendations if the PEOs are not attained. The recommendations are then presented to the DAC and only after the DAC approves the recommendation, the changes are implemented in the program and/or PEOs.

Expected Level of Rating of the Educational Objectives by Alumni (Current Form)

Table 4.1 summarizes the level at which the ISE department expects PEOs of the department listed in Question #4 on the modified (current) alumni survey form to be rated by the alumni. The current alumni survey form and original survey form are presented in Appendix E.

<table>
<thead>
<tr>
<th>Table 4.1 – Faculty Expected Rating of the PEOs by the Alumni</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEO</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Average</td>
</tr>
<tr>
<td>Percent responding 3 or above</td>
</tr>
<tr>
<td>Percent responding 4 or above</td>
</tr>
</tbody>
</table>

Expected Level of Positive Responses to Relevant Questions of the Modified Survey

The ISE department came up with the required level of positive responses on relevant current alumni survey questions in Fall 2010 as shown in Table 4.2 as performance measures for achievement of PEOs (refer to Table 4.6 for the mapping of the current survey questions to the student outcomes). That is, the percentages of the positive responses to relevant questions of the current alumni survey form as stated in Table 4.2 is expected to achieve the corresponding PEO. For example, if 85% of the survey respondents positively respond to question #1 (are you currently working as an IE or in a related field?) and 80% of the survey respondents positively
respond to question #5 (have you led or worked on a project with your company?), then PEO #1 is considered to be achieved.

### Table 4.2: Faculty Expected Percentages of Positive Response

<table>
<thead>
<tr>
<th>Ques/PEO</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>85%</td>
<td>85%</td>
<td>85%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>80%</td>
<td>80%</td>
<td>80%</td>
<td></td>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>6a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50%</td>
</tr>
<tr>
<td>6b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>60%</td>
</tr>
<tr>
<td>7a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>80%</td>
</tr>
<tr>
<td>8a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50%</td>
</tr>
<tr>
<td>9a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30%</td>
</tr>
<tr>
<td>10a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25%</td>
</tr>
<tr>
<td>11a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>60%</td>
</tr>
<tr>
<td>11b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25%</td>
</tr>
</tbody>
</table>

### Alumni Survey Results and Analysis

An alumni survey form was developed in Fall 2006 by Department Advisory Council (DAC) members. A copy of the developed survey form is included in Appendix E. This survey form is referred to as the original survey form. A survey using this original survey form was administered online in Summer 2007. The alumni survey results are provided below. A mapping of the original survey questions to the PEOs is given in Table 4.3.

### Table 4.3: Mapping of the Original Survey Questions to PEOs

<table>
<thead>
<tr>
<th>Ques/PEO</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
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<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>7</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

It can be seen from Table 4.3 that each PEO is mapped to at least two questions on the original survey form.

### Original Survey Results – Summer 2007

**Data Source:** Graduates from 2003-2005 years were surveyed, Eleven online survey respondents.
Table 4.4 presents responses to survey questions where responses are recorded by the respondent number for each question wherever possible. Each box in the table contains a question and corresponding responses by the survey respondents in the numerical order of the respondents.

<table>
<thead>
<tr>
<th>Survey Questions and Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. One hundred percent of the survey respondents was working in IE or IE related field at the time of the survey</td>
</tr>
<tr>
<td>2. Current Job Titles: Project Engineer, Software QA Engineer, Global Spares Analyst, Manufacturing Engineer (2), IE, Manufacturing Engineer (2), Industrial Engineer II, Quality Engineer, Project/Logistics Engineer, pastry engineer</td>
</tr>
<tr>
<td>3. Current and Previous Five Positions</td>
</tr>
<tr>
<td>1. Project engineer, Exp, BAE Systems, Government Engineering Planner, Entry, Lockheed, Government</td>
</tr>
<tr>
<td>2. QA, Mid-Level, VMware, Service QA, Entry, Sezzo Labs, Inc., Service</td>
</tr>
<tr>
<td>3. Project Engineer, Manage Budgets and Schedules, BAE Systems, Defense</td>
</tr>
<tr>
<td>4. Production Supervisor, Pantronix, Corp., Manufacturing</td>
</tr>
<tr>
<td>5. Industrial Engineer II, Manufacturing, Spansion, Semiconductors</td>
</tr>
<tr>
<td>6. Manufacturing Engineer, Manufacturing, Flextronics, Electronics Mfg. Services</td>
</tr>
<tr>
<td>7. IE, IE, DI, Supply Chain</td>
</tr>
<tr>
<td>8. Project engineer, Engr III, Flextronics, Manufacturing Process Engineer, Entry, Pantronix, Manufacturing</td>
</tr>
<tr>
<td>9. Manufacturing Engineer, Engineering, Sanmina-SCI, Medical Devices</td>
</tr>
<tr>
<td>10. Global Spares Analyst, Supply Chain/Operation, Intevac, Manufacturing</td>
</tr>
<tr>
<td>4. Tools and Projects led or Worked on and any cost savings realized</td>
</tr>
<tr>
<td>1. Manage Budgets, Project Engineer, MS Project/Excel/PP, (Yes) Analyze Schedules Designs, Logistics Engineer, Pro-E/I, (No)</td>
</tr>
<tr>
<td>2. Test Automation, team player, Mercury Interactive Test Pro, Quality (Yes)</td>
</tr>
<tr>
<td>3. PR, Microsoft Project, Excel, PowerPoint, and other Budget and Scheduling Software, Manage Budget, Schedule, and resources (yes)</td>
</tr>
<tr>
<td>4. Luminous, team player, Solid Work, Analysis and Quality FS Network, team player, Analysis and Quality (Yes)</td>
</tr>
<tr>
<td>5. Capability Study, Engineer, Cpk Analysis, Control Charts, FMEA, SPC, Process Control Monitoring, (Yes)</td>
</tr>
<tr>
<td>6. Spares Stocking Level Optimization, Lead, Excel and Expandable MRP System, Data Analysis, Consensus building, (Yes)</td>
</tr>
<tr>
<td>5. Any publication reports presentation prepared produced</td>
</tr>
<tr>
<td>1. Test Plan, Internal Report</td>
</tr>
<tr>
<td>2. Maintenance the (process) torque Poke Yoke, Internal Report</td>
</tr>
<tr>
<td>6. Presentation engagements and group training</td>
</tr>
<tr>
<td>1. Control Charts and SMT Lines (Departmental presentation, 10 Attendees, 2007)</td>
</tr>
<tr>
<td>7. Professions or community organization membership</td>
</tr>
<tr>
<td>1. IIE</td>
</tr>
<tr>
<td>8. Community Service Organization and/or Mentoring Program</td>
</tr>
<tr>
<td>9. Any SJSU Mentoring Tutoring Program?</td>
</tr>
<tr>
<td>None</td>
</tr>
</tbody>
</table>
Original Survey Analysis and Conclusions (Summer 2007)
From Tables 4.3 and 4.4 it appears that objective numbers 1, 2, and 3 are adequately satisfied. Objective numbers 1, 2, and 3 refer to be able to function effectively as anISE, use methodologies and computational skills to formulate and develop solutions and collect and interpret data effectively to solve systems analysis and engineering problems. One hundred percent of the survey respondents worked in ISE related field. Of those that led or worked on the projects, 83% of them had their projects realize cost savings. Although, for objective number 3 it appears that only about 60% of respondents seem to have collected, analyzed, and interpreted data to solve engineering problems for the organizations that they worked for.

Based on the survey results, it appears that PEOs 4 (evaluate impact of their solutions in broader context), 5 (communicate effectively), and 6 (life-long learning) are not achieved. There seems to be lack of participation in the professional organizations, workshop attendance, and so on. However, it may also be true that the questions we are using in this survey for the assessment of these three PEOs are not adequate for quantitative assessment. As a result of the original survey findings, the ISE faculty felt that the original survey needs to be modified so that the PEOs can be better assessed.

Improvement Recommended by the ISE Faculty (Fall 2008):
Modify and improve original questionnaire to better assess objective numbers 4, 5, and 6.

After reviewing the results of the original survey form, the DAC members felt that a minor modification in the current alumni survey form is needed to be able to assess the achievement of the program educational objectives. Specifically, to facilitate quantitative assessment of the PEOs, some questions were modified and opinion of the alumni in terms of their belief in achievement of each PEO based on their work experience was added. The modified survey was administered in Spring 2010. The ISE department e-mailed the modified survey form to 50 ISE program graduates from years 2005-2008 in December 2009.

A copy of modified alumni survey form is included in Appendix E. The ISE department received 17 responses (34% survey response). Based on these seventeen survey responses the results can be summarized as follows:

Current Survey Results (Spring 2010)
Fifteen of seventeen survey respondents (88.2%) work in ISE related areas. One respondent is currently unemployed and one respondent is working in marketing area.

Table 4.5 summarizes response to question on how well each respondent believe that he/she has achieved each PEO:
Possible responses ranged from 1 to 5 of each PEO, with 1 as not at all, 2 as some what, 3 as average, 4 as above average, and 5 as mastery.

<table>
<thead>
<tr>
<th>PEO</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>4.176</td>
<td>4.0</td>
<td>4.529</td>
<td>4.118</td>
<td>4.353</td>
<td>4.353</td>
</tr>
<tr>
<td>Percent responding 3 or above</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>94.12</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Percent responding 4 or above</td>
<td>82.35</td>
<td>58.82</td>
<td>94.12</td>
<td>76.47</td>
<td>94.11</td>
<td>88.23</td>
</tr>
</tbody>
</table>

Almost all the respondents believe that they have achieved each PEO at 60% or above (scored at 3 or above) level. All the PEOs, except PEO #2 and PEO #4 are believed to be achieved at 80% of higher (rated 4 or higher) level by at least 80% of the respondents. About 76% of the respondents believe that they have achieved PEO #4 at 80% or higher level (rated 4 or higher), whereas 58.82% of respondents believe that they have achieved PEO #2 at 80% or above (rated at 4 or higher).

About 82.3% of the respondents have led or worked on projects with their company. Some project descriptions include problem solving and process improvements, material review regarding hardware non-conformance, finite capacity planning and level load, modeling and simulation, product-related enhancements, standardization projects, feasibility analysis, inventory level optimization, ERP rollout to subsidiary divisions, yield management, managing supply chain, finding a cause of pressure sensor failure, tele-presence, WebEx, and iRise implementations, and NASA funded projects involving the evaluation of airport surface traffic optimization algorithms through a fast-time computer simulation.

Types of process tools used that were reported include

- Pareto charts, check sheets, time series charts, histograms, process flow charts, spaghetti diagram, box plot, dot diagram, fishbone diagram, affinity diagram, DMAIC, Value stream mapping, process mapping and bar and pie charts
- SPC, ANOVA, t-tests, DOE, CPM, Lean manufacturing, eliminating waste, time study, NPV, IRR, Gap analysis, PERT, OR, Gage R&R, FMEA, FTA, root cause analysis, lean-six sigma, process capability, Oracle: CRM tools,
- ProModel

Out of 14 respondents that have led/worked on projects, 11 (79%) respondents reported that their projects resulted in cost savings. Two respondents reported no cost savings, and one reported unknown.

Fifty percent of those respondents that worked on projects have produced reports, whereas 64% of the respondents have made presentations. Eighty two percent of the respondents have provided training/presentation. Training/presentation topics include introduction to lean, writing
a non-conformance report, internal company processes, six sigma, lean manufacturing workshops, clearance briefings, quality system training, project overview, customer specification training, and changes in forms, processes and procedures in facilities.

Fifty nine percent of respondents belong to professional/community organizations. Organization/community titles include Society of Satellite Professional, International (SSPI), IIE, Tau Beta Pi, The System Safety Society, Metrics Communities of Practice, APICS, American Institute of Aeronautics and Astronautics (AIAA), ASQ, MESA, and Toastmasters International.

About 18% of the respondents have participated in community service/mentoring program, whereas no respondent has participated in SJSU mentoring program. This is not unexpected since the ISE department had not created a structure whereby the graduates can participate in ISE SJSU mentoring program. The ISE Student Club invites ISE graduates to share their work experience and wisdom to current undergraduates of the program from time to time.

Eleven out of the 17 survey (65% of the) survey respondents have completed post-bac degree programs or have earned certificates or have participated in workshops. The titles of the degree programs, certificates, and workshops include MS ISE, Martin Sigma Green Belt, Six Sigma Green Belt, Certified Safety Professional, CPIM, Value Management, and in progress include SJSU MBA/MSE, Lean six sigma black belt, Engineering Leadership Development Program, MS ISE, M.B.A. from Santa Clara University.

Twenty four percent of respondents have received an award after graduation. The awards include Lockheed Martin special recognition award, Cum Laude, Process Improvement Award, Competent Communicator Award, advanced Communicator Bronze Award, Competent Leader Award.

A mapping of question responses that can be quantified to PEOs is given below. Based on the percentage of respondents responding positively to the associated question as seen in Table 4.7, a mapping of the current survey questions to the PEOs is given in Table 4.6.

<table>
<thead>
<tr>
<th>Ques/PEO</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tbody>
<tr>
<td>1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>2</td>
<td>X</td>
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<tr>
<td>3</td>
<td>X</td>
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<td>4</td>
<td>X</td>
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<td>X</td>
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<td>5</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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<td>7</td>
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<td>9</td>
<td>X</td>
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<td>10</td>
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<td>11</td>
<td>X</td>
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</tr>
</tbody>
</table>

A mapping of question responses that can be quantified to PEOs is given below. Based on the percentage of respondents responding positively to the associated question as seen in Table 4.7,
it appears that the PEOs are met by the program graduates. One place an improvement can be made is the alumni participation in mentoring the current students (see 0% respondents responding positively to question 10a regarding SJSU mentoring program).

Table 4.7: Percentage of Respondents Responding Positively to the Survey Questions

<table>
<thead>
<tr>
<th>Ques/PEO</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>88.2%</td>
<td>88.2%</td>
<td>88.2%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>82.35%</td>
<td>82.35%</td>
<td>82.35%</td>
<td>82.35%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6a</td>
<td></td>
<td></td>
<td></td>
<td>50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>64.3%</td>
</tr>
<tr>
<td>7a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>82.4%</td>
</tr>
<tr>
<td>8a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>58.8%</td>
</tr>
<tr>
<td>9a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17.6%</td>
</tr>
<tr>
<td>10a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td>11a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>64.7%</td>
</tr>
<tr>
<td>11b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23.5%</td>
</tr>
</tbody>
</table>

Achievement of PEO #2 and PEO#4 are rated lowest by the respondents as seen in Table 4.5. PEO #2 refers to ability to use methodologies and computational skills to identify, formulate, and develop solutions for problems normally encountered in their organizations and PEO #4 refers to ability to evaluate the impact of their proposed solutions to engineering problems in the broader context of the organization or society. However, the average rating for the both PEOs is at or slightly under/above 4.0 as seen in Table 4.5. As for PEO #2, from Table 4.7 it appears that a large percent (88.2%) of respondents work as an IE or in a related filed and 82.3% of the respondents have led or worked on projects. Based on these two percentages and the descriptions of the projects respondents worked on, the ISE faculty believes that PEO #2 is achieved. As for PEO #4, from Table 4.7 it appears that a large percent (58.8%) belong to professional or community organization. However, a small percent (17.6%) of respondents have participated in any community service or mentoring program and no respondent has participated in SJSU mentoring/tutoring program. The ISE faculty believes that participation of alumni through ISE club and becoming active mentors for the current graduates, the perception of the achievement of PEO #4 by alumni (Table 4.5 rating for PEO #4) can be improved. For this purpose, the graduating seniors during their exit interview will be asked and assigned at least two current students willing to be mentored for their own professional growth and to realize the impact of their mentoring efforts. In addition, alumni will be invited to IIE student chapter gatherings to let the current students know that they are available for mentoring.

B. Student Outcomes

ISE faculty and DAC approved use of the standard ABET outcomes as the ISE student outcomes. These student outcomes have been in place since 2000 and have not been modified since then. However, more recently the department has prepared performance criteria for assessing each outcome directly in Fall 2009. The performance measure for assessing achievement of the student outcomes is also developed by the ISE faculty. The following processes are used that identify, collect and prepare data to evaluate the achievement of program outcomes:
B.1 Direct Evaluation Processes:

1. Performance Criterion and Measure for Each Student Outcome

Performance criteria are evaluated using selected course material every two years.

**Performance measure** used for each outcome under this process is that at least 80% of the students receive 70% or above for each criterion of each program outcome.

See Table 4.8 summarizing performance criteria for each student outcome, corresponding courses used to assess and evaluate student outcomes, and semester in which data are collected and results analyzed every two years

Table 4.8: Student Outcome and Corresponding Performance Criteria along with the Course Numbers

<table>
<thead>
<tr>
<th>ABET Outcome</th>
<th>Performance Criteria</th>
<th>Assessment</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>An ability to apply knowledge of mathematics, science, and engineering</td>
<td>ISE 130</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solve statistical decision making engineering problems <em>(Apply knowledge of mathematics)</em></td>
<td>ISE 130</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solve management decision making engineering problems <em>(Apply knowledge of math, science, and engineering)</em></td>
<td>ISE 170</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solve engineering economic problems <em>(Apply knowledge of mathematics)</em></td>
<td>ISE 102</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>An ability to design and conduct experiments, as well as to analyze and interpret data</td>
<td>ISE 130</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Design and plan process, facilities</td>
<td>ISE 195B</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Develop a strategic and management plans</td>
<td>ISE 195B</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Collaboration and conflict management: team development, interpersonal style, conflict management, participation</td>
<td>ISE 151</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Commented [SC1]: Why only 80% of the students should meet the minimum performance criteria and what is the significance of 70%? Who evaluates the student work and what is the rubric used?
<table>
<thead>
<tr>
<th></th>
<th>Team Communication:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Active listening, feedback, influencing others, sharing information</td>
</tr>
<tr>
<td></td>
<td>ISE 151 X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Team decision making:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Defining a problem, innovation and idea generation, judgment/ using facts, reaching consensus</td>
</tr>
<tr>
<td></td>
<td>ISE 151, X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Team performance on a multidisciplinary project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISE 140 X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>An ability to identify, formulate, and solve engineering problems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Formulate and solve engineering economic analysis problems</td>
</tr>
<tr>
<td></td>
<td>ISE 102 X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Demonstrates improvement of process strategies, cycle time, and WIP reduction</th>
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<tbody>
<tr>
<td></td>
<td>ISE 140 X</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Formulate and solve operations research/management decision making problems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISE 170 X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>An understanding of professional and ethical responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Demonstrates an ability to make informed ethical choices</td>
</tr>
<tr>
<td></td>
<td>ISE 151, 105 X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Demonstrates knowledge of professional code of ethics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISE 151, ISE 195A X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>An ability to communicate effectively</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Communicate in small teams, writing and in variety of other ways</td>
</tr>
<tr>
<td></td>
<td>ISE 120 X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Develop technical writing skills</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ENGR 100W X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Demonstrates effective technical presentations and writing senior design report</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISE 195A and ISE 195B X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Understanding of the impact of engineering solutions in global/societal context</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Evaluate society context of poor quality</td>
</tr>
<tr>
<td></td>
<td>ISE 131 X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Demonstrate approaches to improve quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISE 131 X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Demonstrate the impact and benefits of moving to a leaner production system</th>
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<tbody>
<tr>
<td></td>
<td>ISE 140 X</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Develop green system solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISE 195B X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Recognition of the need for, and an ability to engage in lifelong learning</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Learn to use ProModel, and excel for solving operational problems</td>
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<tr>
<td></td>
<td>ISE 140 X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Learn to use MINITAB and Microsoft Excel for solving statistical quality problems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISE 131 X</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Research and present on contemporary topics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISE 195A X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Research and analyze new information required for system processes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISE 195B X</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Knowledge of contemporary issue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Use of current financial data/parameters to solve engineering decision-making problems</td>
</tr>
<tr>
<td></td>
<td>ISE 102 X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Develop an understanding of the “state of the art” of service management</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISE 142 X</td>
</tr>
</tbody>
</table>
thinking

| Remember/recognize the benefits of a well-defined and integrated supply chain and the technical benefits and impact of an ERP system | ISE 155 | X |
| Research and present contemporary topics | ISE 195A | X |
| Ability to use the techniques, skills and modern engineering tools necessary for engineering practice | ISE 170 | X |
| Learn to use LINDO optimization software to do sensitivity analysis | ISE 167 | X |
| Learn to use a simulation software PROMODEL to do the analysis of the existing systems/processes | ISE 195B, the second Senior Design class. |

2. Senior Exit Exam

The senior exit exams are administered to monitor if at least 80% of the students retain 60% of the knowledge gained in the curriculum.

This component of our program assessment process was implemented in Fall semester of 2004. On review, we had determined that a missing element of the ongoing assessment process was a general understanding of the level of achievement and understanding of basic program topics near the time of the student’s graduation. The Senior Exit Exam was designed and is now administered to all students near the completion of ISE 195B, the second Senior Design class.

The exam was formed by soliciting seven questions (and answers) from the faculty members responsible for each core ISE class. The questions were to represent the fundamental knowledge areas and skills expected to be gained by students in each class. The questions are key concept level questions, focusing on revealing the student’s understanding of the concepts and contextual relevance of the principal material covered in each upper division course. On the order of: “What is the variance and how is it used? “ However: “Can you write the mathematical expression for the variance of a population?” would be too specific as a lead off – writing the expression may be part of the student’s answer, however.

Or: When would you use simulation as opposed to mathematical optimization?
What are some performance measures in simulation studies?
What type of input data are typically used in simulations?
What is the difference between attribute and variable control charts?
When would you use one over the other?

All questions were evaluated in terms of the outcome(s) that they addressed (a – k). A subset of 16 questions across all outcomes and classes was selected for a written examination session. Another subset of 7 questions was selected for an oral examination session.

Senior ISE students in ISE 195B take the written portion of the Exit Exam late in the semester on a Friday afternoon. The exam is scheduled for two hours. The following or the same day, all students return for a scheduled 15 minute oral exam with two ISE professors. All students are presented the same group of questions for both the written and oral portions of the exams.
addition, both portions of the exams are closed book. The exam score counts 10% of their ISE 195B course grade.

For each student, the written exam and oral exam scores are computed across all questions, courses, and for each outcome (a – k). In addition, the scores are summarized across all students for the entire exam and for each outcome (a – k). A copy of the exam questions used in the written and oral portions of the Fall 2006 and Spring 2010 exams is presented in Appendix E. A matrix showing the outcomes associated with each exam question is presented in Table 4.9. The “1” entries in this table refer to the course director’s assessment that the Exit Exam question touches on the outcome identified at the top of the column. The table provides a quick overview of the number of times each program outcome is addressed by the exam overall.

Table 4.9 – Exit exam questions associated with each program outcome

<table>
<thead>
<tr>
<th>Course</th>
<th>Master List</th>
<th>Question No.</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Portion of Exit Exam</td>
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<td>Oral Portion of Exit Exam</td>
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<td>130</td>
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<td>140</td>
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</table>

3. Capstone Project Outcome Assessment

The objective of this procedure is to assess the viability of equating ABET outcomes (a through k) to the ISE senior project reports in order to better understand whether or not the outcomes are indeed being realized through the ISE 195B course. The following procedure to design an assessment method was completed during the Spring 2005 semester:

**Step-1:** Create a matrix type form to rate each project paper (Please refer to Table 4.10).

In order to create such a form, an understanding of how each ABET outcome could be related to sub-sections of the project report had to be determined. Through the project outline and check sheet forms that currently exist and are used to guide students through the project composition, a less than rough ISE course-to-project sub-section correlation can be made.

As such, each defined project section was mapped to one or more ISE courses that were most representative of the material required in that section. For example:
With such a mapping, the most predominant outcomes per course (which had already been determined) could be included into the matrix form for each sub-section of the project report. Note that certain report sections did not have a direct course mapping.

It is also important to note that outcomes: d- ability to function in multi-disciplinary teams, and g- ability to communicate effectively, were not considered in this assessment matrix form. A separate teamwork assessment form will be used for outcome-d, and a separate assessment for outcome-g will be conducted in concert with the oral project presentations.

The initial trial of this form with four Capstone Project reports is discussed in the Outcomes Assessment Results section of this report.

4. DAC Assessment
During the DAC meetings, the department discusses curriculum, individual courses, assessment process and other important issues that are related to the ISE department planning and development. The DAC members give suggestions or feedback on the department courses and curriculum and often brainstorm on the issues related to planning and development of the department.
### Table 4.10 Senior Report Assessment Form

<table>
<thead>
<tr>
<th>COURSE MAPPING</th>
<th>SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISE 195A</td>
<td>1.0 MARKET RESEARCH</td>
</tr>
<tr>
<td>ISE 195A</td>
<td>1.1 Current Products Review</td>
</tr>
<tr>
<td>ISE 195A, ISE 131</td>
<td>1.2 Manufacturer’s Profiles</td>
</tr>
<tr>
<td>ISE 105</td>
<td>1.3 Customer Values Assessment</td>
</tr>
<tr>
<td>(map to outcome directly)</td>
<td>1.4 Functional Description</td>
</tr>
<tr>
<td>ENGR 016, ME 020</td>
<td>1.5 Technology Trends</td>
</tr>
<tr>
<td>ISE 140</td>
<td>2. PRODUCT DESCRIPTION</td>
</tr>
<tr>
<td>ISE 155, ISE 140</td>
<td>2.1 Product Drawings</td>
</tr>
<tr>
<td>ISE 140, ISE 105</td>
<td>2.2 Bill of Materials</td>
</tr>
<tr>
<td>ISE 105, ISE 102</td>
<td>2.3 Materials, Suppliers, SCM</td>
</tr>
<tr>
<td>ISE 140, ISE 105</td>
<td>3. BUSINESS PLAN</td>
</tr>
<tr>
<td>ISE 140, ISE 105</td>
<td>3.1 Product/Process Life Cycle</td>
</tr>
<tr>
<td>ISE 105, ISE 102</td>
<td>3.2 Cost/Pricing/Volume/Profit</td>
</tr>
<tr>
<td>ISE 105, ISE 151</td>
<td>3.3 Financial Statements</td>
</tr>
<tr>
<td>ISE 140 (ISE 115)</td>
<td>4. PROCESS DESIGN</td>
</tr>
<tr>
<td>ISE 120</td>
<td>4.1 Methods and Technologies</td>
</tr>
<tr>
<td>ISE 120</td>
<td>4.2 Routing/Operations Sheets</td>
</tr>
<tr>
<td>ISE 120</td>
<td>4.3 Production Capacity</td>
</tr>
<tr>
<td>ISE 120</td>
<td>4.4 Process Flow</td>
</tr>
<tr>
<td>ISE 102 (ISE 115)</td>
<td>5. PRODUCTION RESOURCES</td>
</tr>
<tr>
<td>ISE 170</td>
<td>5.1 Machines and Equipment</td>
</tr>
<tr>
<td>ISE 159 (ISE 115)</td>
<td>5.2 Labor Requirement (LP)</td>
</tr>
<tr>
<td>(map to outcome directly)</td>
<td>5.3 Material Handling - Mfg</td>
</tr>
<tr>
<td>ISE 159</td>
<td>6. FACILITY DESIGN</td>
</tr>
<tr>
<td>ISE 159</td>
<td>6.1 Facility and Plant Layout</td>
</tr>
<tr>
<td>ISE 159</td>
<td>6.2 Material Handling - Facility</td>
</tr>
<tr>
<td>ISE 159</td>
<td>6.3 Storage and Warehousing</td>
</tr>
<tr>
<td>ISE 167 (ISE 130)</td>
<td>7. MANAGEMENT PLANNING</td>
</tr>
<tr>
<td>ISE 135</td>
<td>7.1 System Simulation</td>
</tr>
<tr>
<td>ISE 102</td>
<td>7.1A Experimental Design</td>
</tr>
<tr>
<td>ISE 102</td>
<td>7.2 Financial Analysis</td>
</tr>
<tr>
<td>ISE 151 (ISE 131)</td>
<td>7.3 Computer Information System</td>
</tr>
<tr>
<td>ISE 151</td>
<td>7.4 Quality Assurance</td>
</tr>
<tr>
<td>ISE 105</td>
<td>7.5 Manpower and Organization</td>
</tr>
<tr>
<td>ISE 151, ISE 105</td>
<td>7.6 Implementation Schedule</td>
</tr>
<tr>
<td></td>
<td>8. DELIVERABLES</td>
</tr>
<tr>
<td></td>
<td>8.1 Proposal</td>
</tr>
<tr>
<td></td>
<td>8.2 Draft and Final Reports</td>
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<tr>
<td></td>
<td>8.3 Presentation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RATING</th>
<th>COMMENTS</th>
<th>SECTION</th>
<th>SUBTOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1= below</td>
<td></td>
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<tr>
<td>2= meets</td>
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<td></td>
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<tr>
<td>3= exceeds</td>
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</tbody>
</table>
B.2 Indirect Evaluation Processes

- Class Outcomes - ISE Department designed for internal use only
- Course surveys (designed by ISE – results remain within the department)
- Student Evaluations of Teaching Effectiveness (SOTE) – (designed by University – reported for RTP).
- Teamwork questionnaire and database
- Senior interview
- Input from
  - alumni,
  - adjunct faculty, and
  - employers of our graduates

The following sections discuss each methodology in detail.

1. Course Outcomes – ISE Department designed for internal use only

Expectations or targets for these student ratings have also been set by each ISE Course Coordinator for the principal outcomes expected in each course. These are also on the scale of 0 – 5 (representing zero to high correlation of each targeted outcome with each course topic). A summary of these ratings targets is presented in Table 4.11. Those that average 4.0 or higher for an outcome across all course topics are shaded in green on the Table.
### Table 4.11 – ISE Student Outcome Evaluation Targets

<table>
<thead>
<tr>
<th>ISE Program Outcome</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
<th>Numbers are the average of goals for each outcome across “Level of Learning by Topic/Activity” as outlined on the course syllabus.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Upper Division courses</strong></td>
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### Notes
- The course survey administered at the end of each course, called the **Course Topic Survey**, is designed to obtain student opinions related to the personal importance and personal mastery of each major topic covered in the course as well as student outcomes (Figure 4.1). The professor prepares the survey by listing the course topics from the semester schedule or course syllabus (see Figure 4.2 for example of the Course Topic Survey from ISE 120 – Work Measurement). Students respond to two questions about each topic:
  I: How important is this course topic to your educational objectives?
  II: What % of the material covered on THIS topic in THIS course do you feel you have learned/achieved?
- The answer scale for question I is five levels ranging “Very important” to “Not important” and is scored as 5 to 1 for analysis. For question II, the five available responses range from “>90%” to “<30%”. Answers are scored 5 to 1 for analysis.
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<th>Line Item</th>
<th>To what extent did THIS COURSE increase your:</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>ability to apply knowledge of mathematics, science, and engineering</td>
</tr>
<tr>
<td>2</td>
<td>ability to design and conduct experiments, as well as to analyze and interpret</td>
</tr>
<tr>
<td>3</td>
<td>ability to design a system, component, or process to meet desired needs</td>
</tr>
<tr>
<td>4</td>
<td>ability to function on multi-disciplinary teams</td>
</tr>
<tr>
<td>5</td>
<td>ability to identify, formulate, and solve engineering problems</td>
</tr>
<tr>
<td>6</td>
<td>understanding of professional and ethical responsibility</td>
</tr>
<tr>
<td>7</td>
<td>ability to communicate effectively</td>
</tr>
<tr>
<td>8</td>
<td>understanding of the impact of engineering solutions in a global and societal context</td>
</tr>
<tr>
<td>9</td>
<td>recognition of the need for, and an ability to engage in life-long learning</td>
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<tr>
<td>10</td>
<td>knowledge of contemporary issues</td>
</tr>
<tr>
<td>11</td>
<td>ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</td>
</tr>
<tr>
<td>12</td>
<td>preparation for engineering practice</td>
</tr>
<tr>
<td>13</td>
<td>knowledge of probability and statistics including applications</td>
</tr>
<tr>
<td>14</td>
<td>ability to analyze and design software components of systems</td>
</tr>
<tr>
<td>15</td>
<td>ability to analyze and design hardware components of systems</td>
</tr>
<tr>
<td>16</td>
<td>knowledge of advanced mathematics such as differential equations, linear algebra, complex variables, and discrete mathematics</td>
</tr>
<tr>
<td>17</td>
<td>How many hours a week do you work? If its 40+ = A, 30+ = B, 20+= C, 10+=D, None=E</td>
</tr>
<tr>
<td>18</td>
<td>How many units are you taking this semester? If its 18+=A, 15-17=B, 14-12=C, 11-6=D, and 0-5=E</td>
</tr>
</tbody>
</table>

Email: _____________________________________________________________________________
________________________________________________________________________________________

Comments: _________________________________________________________________________

This data will be used by the program faculty to help to improve the program for future students. Thank you for your assistance.

Turn page for additional questions
### Course Topic Survey

This questionnaire has 2 questions about all of the topics covered in this course. The questions are at the right, below the Part 1 and Part 2 labels.

Use lines 19 - 40 on the MarkSense answer sheet “Part 1” side to answer the Part 1 question about each Course Topic in the list. Then turn the MarkSense answer sheet over and use lines 45 - 66 to answer the Part 2 question about each Course Topic in the list. **NOTE:** Some “Topic” lines at the bottom of the list may not be used for your course. If so, just ignore those lines on the MarkSense answer sheet.

This data will be used by the program faculty to help to improve the program for future students. Thank you for your assistance.

### List of Topics covered in this course:

<table>
<thead>
<tr>
<th>ON THE ANSWER FORM</th>
<th>Mark in Line number:</th>
<th>Mark in Line number:</th>
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<td>Human Factors / Workplace Ergonomics</td>
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<td>Work Sampling</td>
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<td>Worker and Machine Process Charts</td>
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<td>Line Balancing</td>
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**Note:** Please Skip Numbers 35 and 61 on your answer sheet.

### Question 1

**How important is this course topic to your educational objectives?**

- **A** - Very important
- **B** - Important
- **C** - Moderately important
- **D** - Limited importance
- **E** - Not important / NA

**Mark:**

- >90% Mark "A"
- 70 - 90% Mark "B"
- 50 - 70% Mark "C"
- 30 - 50% Mark "D"
- <30% Mark "E"

### Question 2

**What % of the material covered on THIS topic in THIS course do you feel you have learned/achieved?**

- >90% Mark "A"
- 70 - 90% Mark "B"
- 50 - 70% Mark "C"
- 30 - 50% Mark "D"
- <30% Mark "E"

---

Spring 2004

Contact information: e-mail: _______________________________

Comments: ____________________________________________

When you have completed the MarkSense answer sheet, please provide the data at the left.

Thank you for your assistance.
2. **Student Evaluations of Teaching Effectiveness (SOTE) – SJSU designed and used for RTP**  
Faculty members receive feedback from students every semester on their teaching effectiveness. Questions cover the professor’s knowledge, organization, grading, use of class time, quality of class presentations, and availability, as well as if he/she helped the student learn the material and finally, if the student felt he gained a better understanding of the subject matter. The Program Director receives a copy of these each semester. If there is a noticeable problem in presenting certain topics or learning objectives, the department chair provides guidance to a faculty member to improve his/her effectiveness. The learning objectives map to the student outcomes. Thus indirectly student outcomes achievements are impacted. Since these are confidential documents, they cannot be shared with the reviewer at the visit.

3. **Teamwork Survey and Database**  
The Department designed a Teamwork Survey during the Spring 2005 semester to initiate a focus on assessing student’s teamwork skills, experiences, and development. The survey is to be used at the conclusion of each team project in each class. Students complete the survey answering questions about themselves and each other member of their team for that project. Questions can be seen on Figure 4.3, which is a copy of the current survey form.

Data collected by these forms is considered confidential. It is entered into a database that contains all ratings pertaining to each student; those made by him/herself about him/herself, as well as those made by all others who have been on teams with the student. Across the many course projects that students work on, they will have a chance to consider and rate their own performance, as well as be rated by other students many times. Information from this database will be shared with students during advising sessions, as well as used by instructors to ensure that all students are improving in their teamwork skills and experiences during their academic program.
### ISE Class Project / Team Participation Report

**Your Name:** ____________________________  **Course:** ISE:_____  **No. of Students on Team:** 2 3 4 5*  

**Project Name:** ____________________________________  **Project Length in Weeks:** _____  **Due Date:** ____________

**Participation Report:** Please circle the word corresponding with your opinion about the team work and team participation of each team member on this team project, starting with yourself.

1. **YOURSELF on THIS TEAM:**

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<th>Agree</th>
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</thead>
</table>

*use additional sheet*
4. Senior Exit Interview
Additional data pertaining to the courses and curriculum, faculty, staff, labs, projects, and other aspects of the ISE program is obtained by a final Senior Interview. The interview is regularly conducted by members of the ISE Department Advisory Council (DAC) following the Senior Project presentations each semester. The Interview consists of a written questionnaire of about 100 items (Appendix E) followed by an individual interview conducted by a DAC member. The interview period is used to clarify responses on the questionnaire as may be deemed appropriate by the DAC interviewer as well as to probe any items that appear to be concerning to the student and that may help point the way toward potentials for program improvements.

The questionnaires are scored across all students by a member of the DAC team, and the results are provided to all faculty for review and discussion, including transcriptions of written comments about all faculty and staff members.

B.3 Summary and Analysis of assessment Results

Direct Assessment Processes
1. Performance Criterion and Performance Measure for Each Outcome
As discussed in Section B of Criterion 4, performance criterion for each student outcome was presented in Table 4.8. In Spring 2010 and Fall 2010, the performance criteria for student outcomes were assessed. Table 4.12 contains student outcome, performance criteria used to assess the corresponding outcomes, course used to assess, assessment method used, and assessment result. Note that the performance criteria in the table have been accessed from Table 4.8 of Section B of Criterion 4.

<table>
<thead>
<tr>
<th>Student Outcome</th>
<th>Performance Criteria</th>
<th>Course</th>
<th>Assessment Method</th>
<th>Assessment Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. An ability to apply knowledge of mathematics, science, and engineering</td>
<td>Solve management decision making problems</td>
<td>ISE 170 Fall 2010</td>
<td>Test 1 Q1: Shortest Path problem</td>
<td>90% of the students scored 70% or above</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Test 1 Q4 LP Formulation</td>
<td>90% of the students scored 70% or above</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Test #1 Q5: Simplex Method</td>
<td>60% of the students scored 70% or above</td>
</tr>
<tr>
<td></td>
<td>Calculate probability and mean and variance of a probability distribution. (Apply knowledge of mathematics)</td>
<td>ISE 130 Fall 2010</td>
<td>Test #1 Q4 on finding the cdf, mean, variance of a pdf and finding probability of a r.v. falling in an interval</td>
<td>72.4% of the students scored 70% or above</td>
</tr>
<tr>
<td></td>
<td>Solve engineering economic problems (Apply knowledge of mathematics)</td>
<td>ISE 102 Fall 2010</td>
<td>Final exam Q4e is about finding a taxable income given relevant information</td>
<td>79% of the students scored 70% or above</td>
</tr>
</tbody>
</table>
### Table 4.12b: Outcome b Direct Assessment

<table>
<thead>
<tr>
<th>Student Outcome</th>
<th>Performance Criteria</th>
<th>Course</th>
<th>Assessment Method</th>
<th>Assessment Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. An ability to design and conduct experiments as well as to analyze and interpret data</td>
<td>Solve statistical decision making engineering problems (Analyze and interpret data)</td>
<td>ISE 130 Spring 2010</td>
<td>Final Exam Q1 Testing of hypothesis, sample size, beta error</td>
<td>79.3% students scored 70% or above</td>
</tr>
<tr>
<td></td>
<td>Solve statistical decision making engineering problems (Analyze and interpret data)</td>
<td>ISE 130 Fall 2010</td>
<td>Final exam Q1 about testing one population mean, beta error, sample size, and p-value</td>
<td>86% of the students scored 70% or above</td>
</tr>
<tr>
<td></td>
<td>Design experiments and collect, analyze, and interpret data to solve engineering problems</td>
<td>ISE 135 Fall 2010</td>
<td>Final exam Q5 regarding analyzing and interpreting Latin Square design data</td>
<td>95% of the students scored 70% and above and 81% scored 80% and above</td>
</tr>
<tr>
<td></td>
<td>Collect, analyze, and interpret data in simulation studies</td>
<td>ISE 167 Fall 2010</td>
<td>Lab #4 A plant processes three different types of material into final products. Optimize the throughput given the machine utilization limits using PROMODEL</td>
<td>100% of the students scored 80% or above</td>
</tr>
</tbody>
</table>

### Table 4.12c: Outcome c Direct Assessment

<table>
<thead>
<tr>
<th>Student Outcome</th>
<th>Performance Criteria</th>
<th>Course</th>
<th>Assessment Method</th>
<th>Assessment Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability</td>
<td>Design and plan process, facilities</td>
<td>ISE 195B Spring 2010</td>
<td>Final report: Sections 4 and 6</td>
<td>100% of the students scored 83.3% or above</td>
</tr>
<tr>
<td></td>
<td>Develop a strategic and management plans</td>
<td>ISE 195B Spring 2010</td>
<td>Final report: Section 7</td>
<td>45.45% of the students scored 70% or above</td>
</tr>
<tr>
<td>Student Outcome</td>
<td>Performance Criteria</td>
<td>Course</td>
<td>Assessment Method</td>
<td>Assessment Result</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------------</td>
<td>--------</td>
<td>-------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>d. An ability to function on multidisciplinary team</td>
<td>Collaboration and conflict management: team development, interpersonal style, conflict management, participation</td>
<td>ISE 151 Fall 2010</td>
<td>Final Exam Q11: on a multiple choice question Which of the below is NOT a key characteristic of an effective team:</td>
<td>48% of the student selected the correct choice</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Quiz 2, Q2: On a multiple choice question: The four stages of team development are:</td>
<td>83% of the students selected the correct choice</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Homework 3: short essay question</td>
<td>86% of the students scored 70% or above</td>
</tr>
<tr>
<td>Team Communication:</td>
<td></td>
<td>ISE 151 Fall 2010</td>
<td>Team case study presentation</td>
<td>100% of the team scored 70% or above</td>
</tr>
<tr>
<td></td>
<td>Active listening, feedback, influencing others, sharing information</td>
<td></td>
<td>Final exam Q12: On a multiple choice question Information or ideas can be communicated in what three main ways:</td>
<td>87% of the students selected the correct answer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Homework 8b: short essay written question</td>
<td>90% of the students scored 80% or above</td>
</tr>
<tr>
<td>Team decision making:</td>
<td></td>
<td>ISE 151 Fall 2010</td>
<td>Term team project: Student groups developed team project focus independently, but used the provided project outline for format. Teams engaged in research, brainstorming internally and with the instructor. See ABET hardcopy package for sample project reports, grading sheets, and criteria.</td>
<td>88% of the teams scored 70% or above</td>
</tr>
<tr>
<td></td>
<td>Defining a problem, innovation and idea generation, judgment/using facts, reaching consensus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team performance on a multidisciplinary project</td>
<td></td>
<td>ISE 140 Fall 2010</td>
<td>Term project on forecasting, planning, and scheduling</td>
<td>79% of students scored 70% or higher</td>
</tr>
<tr>
<td>Student Outcome</td>
<td>Performance Criteria</td>
<td>Course</td>
<td>Assessment Method</td>
<td>Assessment Result</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------</td>
<td>-----------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>e. An ability to identify, formulate and solve engineering problems</td>
<td>Formulate and solve operations research /management decision making problems</td>
<td>ISE 170</td>
<td>Final exam Q4: queuing problem formulation and developing solution</td>
<td>83.3% of students scored 70% or above</td>
</tr>
<tr>
<td>f. Demonstrate understanding of professional &amp; ethical responsibility</td>
<td>Demonstrates ability to make informed ethical choices</td>
<td>ISE 151</td>
<td>Mid-Term Exam question: on ethics</td>
<td>59% of the students selected correct answer</td>
</tr>
<tr>
<td></td>
<td>Demonstrates knowledge of professional code of ethics</td>
<td>ISE 151</td>
<td>Ethics Assignment: Students wrote a P.O.V paper after reading an excerpt on the Challenger disaster. (see ABET hardcopy package for assignment guide and sample papers)</td>
<td>100% of the students scored 84% or above</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Final exam Q13: On a multiple choice question: From the Code of Ethics for Engineers, in the fulfillment of their professional duties, shall NOT be exceeded.</td>
<td>91% student selected correct answer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Homework 8a: short essay style written response</td>
<td>81% of the students scored 70% or above</td>
</tr>
<tr>
<td>Student Outcome</td>
<td>Performance Criteria</td>
<td>Course</td>
<td>Assessment Method</td>
<td>Assessment Result</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------------</td>
<td>--------</td>
<td>-------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>g. Ability to communicate effectively</td>
<td>Demonstrates effective technical presentations and writing senior design report</td>
<td>ISE 195B Spring 2010</td>
<td>Oral Presentation</td>
<td>100% students scored 76% or above</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Appearance, organization and structure of the report</td>
<td>100% of the students scored 100%</td>
</tr>
<tr>
<td></td>
<td>Communicate in small teams, writing and in variety of other ways.</td>
<td>ISE 120 Spring 2010</td>
<td>Written report and oral presentation</td>
<td>100% of the students received 86% or above in final both written report and oral presentation. 100% of the students scored</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ISE 151 Fall 2010</td>
<td>Final Exam: Two multiple choice questions on team leader</td>
<td>76% of students chose correct answer of one question while 71% of students chose correct answer of the second question</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ISE 151 Fall 2010</td>
<td>Final Exam: Two multiple choice questions on communication as a leader</td>
<td>43% of the students chose correct answer for one question and 71% of the students chose correct answer for the second question</td>
</tr>
<tr>
<td></td>
<td>Demonstrates effective technical presentations and writing senior design report</td>
<td>ISE 195A Fall 2010</td>
<td>Presentation #2: A short presentation on selected contemporary topics</td>
<td>100% of the students received 80% or higher</td>
</tr>
<tr>
<td></td>
<td>Develop technical writing skills</td>
<td>ENGR 100W</td>
<td>Over all course score</td>
<td>100% of the students score 70% or above when they pass the course</td>
</tr>
</tbody>
</table>
### Table 4.12h: Outcome h Direct Assessment

<table>
<thead>
<tr>
<th>Student Outcome</th>
<th>Performance Criteria</th>
<th>Course</th>
<th>Assessment Method</th>
<th>Assessment Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>h. Understanding of the impact of engineering solutions in global/societal context</td>
<td>Evaluate society context of poor quality</td>
<td>ISE 131 Spring 2010</td>
<td>Final exam: multiple choice question numbers 8, 10, 14, and 18</td>
<td>84.6% of the students scored 70% or above</td>
</tr>
<tr>
<td></td>
<td>Demonstrate approaches to improve quality</td>
<td>ISE 131 Spring 2010</td>
<td>Final exam: 40 multiple choice questions: Understand approaches to improve quality</td>
<td>84.6% of the students scored 70% or above</td>
</tr>
<tr>
<td></td>
<td>Demonstrate the impact and benefits of moving to a leaner production system</td>
<td>ISE 140 Fall 2010</td>
<td>Term project: various approaches</td>
<td>100% of the students scored 70% or higher</td>
</tr>
<tr>
<td></td>
<td>Develop green system solutions</td>
<td>ISE 195B Spring 2011</td>
<td>Project Report addresses green systems issues</td>
<td>100% of the students scored 70% or higher</td>
</tr>
</tbody>
</table>

### Table 4.12i: Outcome i Direct Assessment

<table>
<thead>
<tr>
<th>Student Outcome</th>
<th>Performance Criteria</th>
<th>Course</th>
<th>Assessment Method</th>
<th>Assessment Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Recognition of the need for, and an ability to engage in lifelong learning</td>
<td>Learn to use MINITAB for solving statistical quality problem</td>
<td>ISE 131 Spring 2010</td>
<td>Term project</td>
<td>100% of the students scored 100%</td>
</tr>
<tr>
<td></td>
<td>Learn to use a ProModel, and excel for solving operational problems</td>
<td>ISE 140 Fall 2010</td>
<td>Term Project: Tool component</td>
<td>100% of the students scored 100%</td>
</tr>
<tr>
<td></td>
<td>Research and present on contemporary topics</td>
<td>ISE 195A Fall 2010</td>
<td>Presentation #2 on contemporary topics</td>
<td>100% of the students scored 86% or above</td>
</tr>
<tr>
<td></td>
<td>Research and analyze new IE topics</td>
<td>ISE 195A Spring 2010</td>
<td>Presentation #1 on Contemporary topics</td>
<td>100% of the students scored 70% or above</td>
</tr>
</tbody>
</table>
Table 4.12j: Outcome j Direct Assessment

<table>
<thead>
<tr>
<th>Student Outcome</th>
<th>Performance Criteria</th>
<th>Course</th>
<th>Assessment Method</th>
<th>Assessment Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>j. Knowledge of contemporary issues</td>
<td>Develop an understanding of the “state of art” of service management thinking</td>
<td>ISE 142</td>
<td>Term project on service organization and its operations</td>
<td>81% of the students scored 70% or above.</td>
</tr>
<tr>
<td></td>
<td>Demonstrate the benefits of a well-defined and integrated supply chain and technical</td>
<td>ISE 155</td>
<td>Final Exam Q5 on role of information in supply chain</td>
<td>82% of the students scored 70% or above.</td>
</tr>
<tr>
<td></td>
<td>benefits and impact of an ERP system</td>
<td>Fall 2010</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of current financial data/parameters to solve engineering decision-making problems</td>
<td>ISE 155</td>
<td>Final exam Q9 on ERP and its importance in supply chain integration</td>
<td>94% of the students scored 70% or above.</td>
</tr>
<tr>
<td></td>
<td>Research and present contemporary topics</td>
<td>ISE 195A</td>
<td>Presentation #2 on contemporary topics</td>
<td>100% of the students scored 80% or above</td>
</tr>
</tbody>
</table>

Table 4.12k: Outcome k Direct Assessment Data

<table>
<thead>
<tr>
<th>Student Outcome</th>
<th>Performance Criteria</th>
<th>Course</th>
<th>Assessment Method</th>
<th>Assessment Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>k. Ability to use the techniques, skills and modern engineering tools necessary for engineering practice</td>
<td>Learn to use a simulation software PROMODEL to do the analysis of the existing systems/processes</td>
<td>ISE 167</td>
<td>Final Project: Optimizing batch sizes for sub-product processing and # of machines required at each work station to meet a week’s production requirements given BOM and cost of addition and deletion of machines and idle time of machines</td>
<td>100% of the teams scored 85% or above</td>
</tr>
<tr>
<td></td>
<td>Learn to use an optimization software LINDO to do the sensitivity analysis of the</td>
<td>ISE 170</td>
<td>Homework # 3 problem #6-6.2 on sensitivity analysis using LINDO</td>
<td>94% of the students scored 80% or above</td>
</tr>
<tr>
<td></td>
<td>existing systems/processes</td>
<td>Spring 2011</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Based on the data collected in Spring 2010 and Fall 2010, some performance criteria of student outcomes a, c, d, f, h, i, j and k are achieved at the desired level of at least 80% of the students scoring 70% or above (as seen from Tables 4.12a-k). Note that the performance measure for assessment of student outcomes based on course work was stated in Section B.1 of Criterion 4. More specifically, each outcome direct assessment results are summarized next.

**Evaluation of Assessment Data (Tables 4.12a-4.12k)**

*Outcome a*: more time and effort must be spent teaching simplex method. More homework problems on this topic were given in Spring 2011. The instructor spent one class on solving linear programming problems using the simplex method along with the students to practice and develop in-depth understanding of the method. As a result of this effort 85% of the student scored 90% or above (95% of the students scored 70% or above) an increase from 60% of the students scoring at least 70% or above in Spring 2010.

The instructor spent more time discussing and presenting problems on the concepts of the probability and on how to calculate probability, mean and variance of a random variable. The first quiz of ISE 130 of Spring 2011 covered the basic concepts of probability and how to calculate mean and variance of a random variable. As a result of this effort, 85.7% of the students scored 70% or above, an improvement from 72.4% of the students scoring 70% or above in Fall 2010.

*Outcome b*: almost achieved for the performance criterion used. More time was spent on the testing of hypothesis topic and more problems related to testing of hypothesis were solved in Fall 2010. As a result of this effort, 86% of the students scored 70% or above on testing of hypothesis question of the final exam of ISE 130 (an increase from 79.6% scoring 70% or above to 86%).

*Outcome c*: one performance criterion is achieved while the other one is not achieved. The instructor of the course ISE 195B spent more time with the students in developing strategic and management plans in Spring 2011. As a result of this effort, 100% of the reports scored 90% or above in Section 7, an improvement from 45.45% of the reports scoring 70% or above in Spring 2010.

*Outcome d*: Students performed well in the knowledge of team communication and team decision making. However, there was a lack of knowledge in effective team management. In Fall 2011, the instructor will spend more time on effective management area. On a multidisciplinary term project of ISE 140 course, 79% of the students scored 70% or above, quite close to our target. However, efforts will be made by the instructor in Fall 2011 to improve performance on a multidisciplinary term project.
Outcome e: For the performance criterion considered, this outcome is achieved at the desired level.

Outcome f: One of the performance criteria is not achieved at the desired level. The instructor of ISE 151 spent more time in covering informed ethical choices topic in Fall 2010. However, the students do have a good knowledge of professional code of ethics as seen from the assessment results of the professional code of ethics performance criterion.

Outcome g: Performance criterion on team communication, specifically as a leader was not achieved at desired level. The instructor of ISE 151 will spend more time on discussing about leadership and communication area in Fall 2011.

Outcome h, i, j, and k are achieved at desired level for the performance criteria considered in Spring 2010, except outcome k is achieved in Spring 2011.

2. Senior Exit Exams

A Senior ISE Comprehensive Exam was implemented Fall 2004 semester. The content and structure of the exam has been discussed previously in this report (Section B.3.5).

Answers were graded by ISE faculty members on a scale from 0 – 5, with 5 representing a complete and correct response.

Each question on the exam was also determined to be associated with the achievement in one or more student outcome see for example, Table 4.9 of Criterion 4. Table 4.13 shows students scores on the exit exam for each semester during the current ABET review period during which ISE 195B was offered. Table 4.13 also shows the average scores by questions, number of students receiving a score of 3 or higher and the percentage of students receiving 60% or higher by questions. Table 4.14 shows average scores by outcome for each semester during the current ABET review period the exit exam was offered and overall average score. Table 4.15 shows the percentage of student scoring 60% or higher and the average percentage of students scoring 60% or higher.
Table 4.13 Senior Exit Exam Results

<table>
<thead>
<tr>
<th>Topic/Course</th>
<th>Written Portion of the Exam</th>
<th>Oral Portion of the Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall 2005</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pct Total</td>
<td>102 Engr Econ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>115 Adv Mfg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>130 Statistics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>135 Design of Experiments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>151 Engrmt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>170 Oprn Rich</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Written Pct Score</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120 Work Meas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>131 Qual Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>170 Oprn Rich</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oral Pct Score</td>
</tr>
</tbody>
</table>

| Questions | Max Points | Student 1 | Student 2 | Student 3 | Student 4 | Student 5 | Student 6 | Student 7 | Student 8 | Student 9 | Student 10 | Student 11 | Student 12 | Student 13 | Student 14 | Student 15 | Student 16 |
|-----------|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|          | 5          | 5         | 5         | 5         | 5         | 5         | 5         | 5         | 5         | 5         | 5         | 5         | 5         | 5         | 5         | 5         |
|          | 3          | 4         | 5         | 4         | 5         | 3         | 2         | 2         | 2         | 2         | 2         | 2         | 2         | 2         | 2         | 2         |
|          | 1          | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         |
|          | 1          | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         |
|          | 1          | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         | 1         |
|          | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |
|          | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |
|          | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |
|          | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |
|          | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |
|          | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |
|          | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |
|          | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |

| Avg Score | 2.5          | 2.5        | 3.3        | 3.8        | 2.1        | 2.4        | 1.4        | 1.3        | 2.9        | 3.7        | 4.4        | 3.2        | 2.3        | 3.5        | 2.7        | 2.1        | 3.1        | 3.1        | 1.4        | 2.8        | 6.4        |

% of students receiving >=3 = 50%

% of students receiving higher than 60% or higher = 50%

mapping outcomes a,e,k a,c,e,k c,a,c,g,b,c,e k a,e g,b,c,e a,b,e a,b,e a,e,k a,e,k e b a,b,e a,b,e e b,c,e,a,e a,e k i a a,c,e i,g,k,a e,j a,e,k,b,c,e

67.3%

60.7%

80.3%

56.3%

71.7%

39.0%

38.3%

63.7%

71.7%

63.7%

56.0%

37.0%

49.7%

68.3%

39.7%
### Table 4.13 Senior Exit Exam Results (Continued)

#### Student Scores on the ISU Senior Exit Exam - Spring 2008

| Topic/Course | Written Portion of the Exam | Oral Portion of the Exam | POS Total Score |
|--------------|-----------------------------|--------------------------|-----------------
| Student 1    | 0 5 5 2.5 2.5 2.5 5 5 5 5 4 3.5 5 5 4.5 5.5 4.5 5 3 1 72.5% | 2.75 0.5 5 5 5 5 4 72.9% | 71.7% |
| Student 2    | 0 4 2.5 4 0 2 3 2 2 5 3.5 0 4 5 1 0 3 5 3 5 54.0% | 5 0.5 2.5 1.5 3.75 0.5 1.5 15 42.1% | 50.9% |
| Student 3    | 0 4 4 2.5 5 5 5 2 2.5 5 3 3 5 5 5 5 5 5 2.5 70.0% | 4 0 5 3 5 2 4 46.7% | 72.6% |
| Student 4    | 0 4 2.5 3 2 4 5 2.5 0 5 5 2 4 1.5 5 2.5 5 4.5 2 0 54.0% | 4.5 0 2 3 5 5 3.15 4 62.1% | 56.5% |
| Student 5    | 4 4.5 2 2.5 3 0 4 3 5 5 2 1.5 5 5 2 1.5 4.5 5 2 0 61.5% | 8 0 3.5 4.5 5 4 3.5 72.9% | 64.4% |
| Student 6    | 0 4 4 5 5 5 2.5 2.5 5 5 5 0 3.5 3 1.5 1 3.5 1.5 0 57.0% | 4.5 0 1.5 4.75 5 1.5 63.6% | 58.7% |
| Student 7    | 0 0 1 5 2 0 0 0 2 2 5 2.5 0 5 3 1.5 5 5 2 5 0 1 3.5 44.0% | 2 1 0 0 0.75 0.5 0.5 16.4% | 36.9% |
| Student 8    | 0 4 5 3 2 0 0 3 5 4 5 2.5 0 5 3.5 3.5 0 3 0 4 0 53.0% | 4 0 3 5 4 5 2 65.7% | 56.3% |
| Student 9    | 0 2 4 1.5 4 1.5 3 4 5 5 4 4 0 1 2 0 5 0 2 3 51.0% | 4 0 2 3 4 1 2 45.7% | 49.6% |
| Student 10   | 0 4 0 2 4.5 0 2 5 0 0 2 1 1 0 3 0 0 0 0 5 25.5% | 5 0 1 4 3.5 3.5 2 53.6% | 35.7% |
| Student 11   | 0 5 2 1.5 2 0 2.5 0 5 5 2.5 4 0 5 5 1 2 0 2 3 45.0% | 5 0 2 3 4 3 3 57.1% | 48.5% |
| Student 12   | 0 4 5 2.5 2.1 1 1 3 4 3.5 5 2.5 4 1.5 4 1.5 4 2 2 1 2 49.0% | 4 0 2 3 4 1 1 42.7% | 47.4% |
| Student 13   | 0 4 2.5 2 4 1 0 0 5 0 2 5.0 0 3 1 5 3 5 1 1 1 41.0% | 3 0 2 1 0 1 2 25.7% | 37.0% |
| Student 14   | 0 5 1 5 4 5 3 3 0 2 0.5 4 5 3.5 1 0 4 5 0 0 0 56.0% | 5 0 0 5 5 5 3 2 42.0% | 52.6% |
| Student 15   | 0 5 2 5.5 3.5 2 5 5 0 4 3.5 0 2 5 5 5 0 0 0 5 48.0% | 3.5 0 1.5 4 5 2 0 45.7% | 47.4% |
| Student 16   | 1 4.5 5 3 3.5 3.5 3 3 2 0 3.5 3 5 5 5 2 1.5 3 3 5 64.5% | 4 0 3 2 4 0 3 45.7% | 59.6% |
| Student 17   | 1 4 0 0 4 2 2 0 1.5 5 4 4 0 1.5 3 0 4 1.5 0 5 42.3% | 5 5 0 3 4 0 2 54.3% | 45.6% |
| Student 18   | 0 4 5 5 0 0 1.5 0 0 5 3.5 4 0 5 5 0.5 0 4 1 4 48.0% | 5 0 3 2 5 3 2 50.3% | 49.1% |
| Student 19   | 3 4 5 5 3.5 4.5 2.5 5 5 2 3.5 4 2.5 5 5 0 3 5 3 5 75.5% | 3 0 4 3 5 4 4 65.7% | 73.0% |
| Student 20   | 0 5 3 4.5 1.5 1.5 3 0 0 1 5 3 0 3 4 0.5 1.5 0 1 3 35.0% | 3 0 1 1 4 3 3 42.9% | 57.0% |

**Avg Score:** 0.5 3.7 3.1 2.8 2.9 2.3 2.3 2.9 3.0 3.4 3.4 2.4 2.8 3.8 3.8 3.8 3.1 2.3 1.5 2.9 55.2% | 42 8 2.1 3.1 3.7 2.4 2.3 51.5% 52.3% |

**No. of students receiving >=**

| 3 2 16 | 3 2 | 16 | 7 |
| 10 80 45 40 | 60 40 45 60 | 50 65 65 60 50 75 70 5 65 40 30 60 | 100 5 35 70 80 50 35 |

**% of student received 60% or higher**

| a,b,c,k,k | g,k | e,g,k,k | a,b,a,k,a,b,c | a,b,e,a,e | a,b,e,a | a,b,c | a,c,e | a,g,k,a,e,k,k | e,a,e,k,k | e |
### Table 4.13 Senior Exit Exam Results (Continued)

**Student Scores on the ISE Senior Exit Exam - Fall 2006**

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| Avg Score | 1.6 | 2.2 | 3.0 | 4.2 | 4.8 | 1.4 | 3.4 | 2.0 | 1.2 | 2.7 | 3.3 | 2.1 | 4.4 | 3.4 | 2.7 | 2.3 | 5.0 | 4.2 | 3.8 | 0.0 | 57.5% | 4.6 | 4.7 | 4.3 | 5.0 | 4.9 | 5.0 | 3.6 | 91.4% | 66.3% |

| No. of students receiving >=3 | 2 | 4 | 6 | 8 | 9 | 2 | 7 | 3 | 2 | 4 | 5 | 1 | 8 | 8 | 4 | 2 | 9 | 8 | 8 | 0 | 8 | 9 | 9 | 9 | 9 | 9 | 7 |

| % of students received 60% or higher | 22.2 | 44.4 | 66.7 | 88.9 | 100 |

| mapping outcomes | a.e.k | b.c.e | e | e | e.k | f.g.h | k.e | a.k | h | h | a.b.e | c.e | f | f.c | c.e | a.k.k | a.e.k | b.c.e | a.c.e | e.k | f.g.h | c.e | a.e.k |

| | 100 | 100 | 100 | 100 | 100 | 77.8 |
### Table 4.13 Senior Exit Exam Results (Continued)

#### Written Portion of the Exam

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**No. of Students receiving 100%**

| 10 | 8 | 12 | 14 | 17 | 11 | 15 | 19 | 15 | 12 | 15 | 7 | 5 | 11 | 15 | 19 | 9 | 8 | 12 | 13 | 15 | 19 | 19 | 19 | 13 | 19 |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|

**% of students who scored 60% or higher**

| 45.45 | 36.36 | 54.55 | 63.64 | 77.27 | 50 | 68.18 | 45.45 | 68.18 | 86.36 | 54.55 | 68.18 | 31.82 | 22.73 | 50 | 68.18 | 86.36 | 40.91 | 36.36 | 100 |
|-------|-------|-------|-------|-------|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|-------|-------|-------|-------|-----|

**Outcomes**

| a.e | a.e.a.e | a.e.e | a.e.e.e | g.k | g.e.a.k | a.e.k | a.e.k.a.e | a.k | a.e.a.e | a.e.a.e | a.e.a.e | a.e.a.e.a.e | a.e | b.e.a.e | a.e.e | a.e.e.e | g.a | g.a.e.a.k | a.e.k | a.e.a.e | a.e.a.e | a.e.a.e.a.e | a.e | b.e.a.e | a.e.e | a.e.e.e |
### Table 4.13 Senior Exit Exam Results (Continued)

**Student Scores on the ISE Senior Exit Exam - Fall 2007**

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#### Oral Portion of the Exam

| Avg Score | 4.2 | 2.4 | 1.6 | 2.5 | 2.7 | 1.7 | 2.5 | 4.0 | 2.6 | 4.8 | 2.7 | 2.4 | 3.3 | 2.6 | 1.9 | 4.5 |
| Pct Total Score | 57.5% | 2.5 | 3.2 | 3.3 | 3.5 | 3.4 | 2.2 | 59.8% | 55.6% |
### Table 4.13 Senior Exit Exam Results (Continued)

#### Written Portion of the Exam

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<th>Topic/Course</th>
<th>Max Pts</th>
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<th>Mfg</th>
<th>Work</th>
<th>Meas</th>
<th>Statist</th>
<th>Qualit y Contr ol</th>
<th>Opsn Ping &amp; Contr</th>
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Student 1
- 3.5 3 2 0 5 2 2 5 0 5 3.5 2.5 5 5 0 3 54.7%
- 4.5 1 1.5 4.5 5 5 1 1 52.9%

Student 2
- 5 5 1 5 5 4 5 5 5 3.5 5 9 10 2 5 88.8%
- 5 5 4.5 5 5 4.5 5 5 97.1%

Student 3
- 4 3 5 3 0 3.5 5 5 0 3.5 5 2 3.5 7 1 3 62.9%
- 2.5 0 1 3 5 0 3 41.4%

Student 4
- 5 3 4 5 5 5 5 5 5 5 5 5 2 0 9 5 9 3 5 82.4%
- 3.5 5 2 3.5 2 2 5 85.7%

Student 5
- 5 2 5 2 5 4 5 4 4 4 5 3 5 5 7 2 5 80.0%
- 5 5 4.5 5 4.5 5 5 97.1%

Student 6
- 4.5 3 3 2 5 3.5 4 5 5 3 4 5 7 1 5 76.5%
- 4.5 5 4 5 5 5 5 95.7%

Student 7
- 4 2 5 5 5 5 3 2 5 4 5 5 8 5 5 84.7%
- 4.5 5 4 3.5 4 3.5 4 3.5 85.8%

Student 8
- 5 5 3.5 2 5 4.5 5 5 5 3 5 5 8 2 5 85.9%
- 4.5 5 3 5 5 5 5 92.9%

#### Oral Portion of the Exam

<table>
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<th>Topic/Course</th>
<th>Max Pts</th>
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<th>Syst</th>
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<th>Mfg</th>
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</table>

Student 1
- 3.5 3 2 0 5 2 2 5 0 5 3.5 2.5 5 5 0 3 54.7%
- 4.5 1 1.5 4.5 5 5 1 1 52.9%

Student 2
- 5 5 1 5 5 4 5 5 5 3.5 5 9 10 2 5 88.8%
- 5 5 4.5 5 5 4.5 5 5 97.1%

Student 3
- 4 3 5 3 0 3.5 5 5 0 3.5 5 2 3.5 7 1 3 62.9%
- 2.5 0 1 3 5 0 3 41.4%

Student 4
- 5 3 4 5 5 5 5 5 5 5 5 5 2 0 9 5 9 3 5 82.4%
- 3.5 5 2 3.5 2 2 5 85.7%

Student 5
- 5 2 5 2 5 4 5 4 4 4 5 3 5 5 7 2 5 80.0%
- 5 5 4.5 5 4.5 5 5 97.1%

Student 6
- 4.5 3 3 2 5 3.5 4 5 5 3 4 5 7 1 5 76.5%
- 4.5 5 4 5 5 5 5 95.7%

Student 7
- 4 2 5 5 5 5 3 2 5 4 5 5 8 5 5 84.7%
- 4.5 5 4 3.5 4 3.5 4 3.5 85.8%

Student 8
- 5 5 3.5 2 5 4.5 5 5 5 3 5 5 8 2 5 85.9%
- 4.5 5 3 5 5 5 5 92.9%

#### Average score across both examiners

- Oral Total Score: 77.3%
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### Table 4.13 Senior Exit Exam Results (Continued)

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#### Average score across both examiners

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<td>Sim 167</td>
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#### Avg Score

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### Table 4.13 Senior Exit Exam Results (Continued)

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<th>Oral Portion of the Exam</th>
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No. of students receiving >=3

| % of students received higher than 60% | 70 | 70 | 80 | 90 | 90 | 80 | 90 | 70 | 90 | 90 | 100 | 80 | 90 | 70 | 40 | 100 | 90 | 40 | 20 | 100 | 100 | 100 | 90 | 100 | 100 |

Mapping outcomes: a, b, e, c, k, k, g, k, a, e, k, e, e, e, f, f, e, c, e, a, e, a, e, k, i, b, c, a, e, c, k, f, g, k, a, e, k, e, b, c, e
Table 4.31 Senior Exit Exam Results (Continued)  

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<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>Avg Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Points</td>
<td>9</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

**Student 1**  
5.0 5.0 5.0 4.0 3.0 4.5 4.5 4.0 3.0 5.0 4.0 3.0 1.0 2.0 3.5 4.0 2.0 1.0 2.0 5.0

**Student 2**  
5.0 1.0 5.0 5.0 2.0 4.0 4.5 5.0 5.0 5.0 0.0 4.0 2.0 4.0 5.0 2.0 5.0 3.0 5.0

**Student 3**  
5.0 2.5 5.0 5.0 2.0 4.5 5.0 5.0 5.0 5.0 5.0 2.0 1.0 0.0 5.0 5.0 0.0 3.0 5.0 0.0

**Student 4**  
5.0 3.5 5.0 3.5 3.0 2.0 5.0 5.0 4.0 5.0 1.0 3.0 1.0 3.5 5.0 1.0 1.0 3.0 5.0

**Student 5**  
5.0 1.5 2.5 4.0 5.0 4.5 4.0 5.0 5.0 5.0 5.0 0.0 0.0 3.0 2.3 4.0 5.0 3.0 5.0 4.0 5.0

**Student 6**  
5.0 4.5 4.5 4.0 3.0 5.0 5.0 5.0 4.5 5.0 5.0 1.0 4.0 5.0 4.0 5.0 4.0 5.0 4.0 5.0

**Student 7**  
5.0 2.5 2.0 3.5 5.0 1.5 3.5 3.5 4.5 5.0 0.0 0.0 3.0 4.0 2.5 4.0 4.5 1.0 5.0 56.7%

**Student 8**  
3.0 1.0 2.0 4.0 2.0 1.0 3.0 4.0 5.0 3.5 5.0 4.0 2.9 3.0 4.0 3.0 4.0 3.0 4.0 5.0

**Student 9**  
5.0 4.5 1.0 5.0 2.0 2.0 3.0 4.0 3.0 2.5 2.0 2.0 4.0 5.0 4.0 5.0 4.0 5.0 4.0 5.0

**Student 10**  
5.0 3.5 5.0 5.0 4.0 1.5 5.0 5.0 5.0 5.0 5.0 4.0 4.0 1.0 4.0 5.0 5.0 3.0 7.0 5.0 67.6%

**Student 11**  
5.0 2.0 3.5 5.0 2.0 3.5 1.0 5.0 5.0 5.0 5.0 5.0 3.0 5.0 2.0 4.3 3.0 5.0 5.0 65.7%

**Student 12**  
5.0 3.5 2.4 2 4.5 1 5 3 5 4 5 4 4 3 5 3 5 3 5 3 70.5%

**Student 13**  
4.5 2.9 3.5 4.3 2.9 3.2 3.7 4.6 2.4 4.8 4.3 3.0 2.8 2.1 3.4 4.4 3.1 3.6 2.9 4.6 66.5%

**Student 14**  
7.0 2.9 3.8 3.6 3.5 4.5 2.0 3.6 64.4%

**Student 15**  
5.0 5.0 10.0 5.0 8.0 11.0 6.0 11.0 5.0 10.0 9.0 8.0 11.0 6.0 11.0

**No. of students**  
11 6 7 11 6 7 10 12 11 11 7 8 3 9 11 8 9 7 11 8.0 5.0 10.0 9.0 8.0 11.0 6.0 11.0

**% of students received higher than 60%**  
92 50 58 92 50 58 83 100 92 92 58 67 25 75 92 67 75 58 92 50 42 83 75 87 92 50 92

**mapping outcomes**  
a j k a c e f g h k c f e g a k a c e b d e j a c h h a b e b a b c e
Figure 4.14 Average Score by Questions and Overall Average Score by Each Outcome

<table>
<thead>
<tr>
<th>Number of Questions</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Issues</td>
<td>3.3</td>
<td>3.8</td>
<td>3.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>3.3</td>
<td>3.8</td>
<td>3.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Chain</td>
<td>3.3</td>
<td>3.8</td>
<td>3.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Source</td>
<td>3.3</td>
<td>3.8</td>
<td>3.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Overall</td>
<td>3.3</td>
<td>3.8</td>
<td>3.8</td>
<td>3.8</td>
</tr>
</tbody>
</table>
Figure 4.14 Average Score by Questions and Overall Average Score by Each Outcome (continued)
Figure 4.15 Percentage of Students Scoring 60% or Higher and Overall Average Percentage of Students by Each Outcome

<table>
<thead>
<tr>
<th>Number of Questions</th>
<th>Manufacturing</th>
<th>Operations</th>
<th>Supply Chain</th>
<th>Sales and Marketing</th>
<th>Service Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>81.1%</td>
<td>80.3%</td>
<td>82.5%</td>
<td>80.3%</td>
<td>76.3%</td>
</tr>
<tr>
<td>2</td>
<td>73.8%</td>
<td>73.4%</td>
<td>75.2%</td>
<td>73.4%</td>
<td>71.4%</td>
</tr>
<tr>
<td>3</td>
<td>67.3%</td>
<td>66.1%</td>
<td>68.2%</td>
<td>66.1%</td>
<td>64.0%</td>
</tr>
<tr>
<td>4</td>
<td>60.9%</td>
<td>60.3%</td>
<td>62.3%</td>
<td>60.3%</td>
<td>58.0%</td>
</tr>
<tr>
<td>5</td>
<td>66.0%</td>
<td>65.1%</td>
<td>67.1%</td>
<td>65.1%</td>
<td>62.9%</td>
</tr>
<tr>
<td>6</td>
<td>59.7%</td>
<td>59.0%</td>
<td>61.0%</td>
<td>59.0%</td>
<td>56.7%</td>
</tr>
<tr>
<td>7</td>
<td>53.4%</td>
<td>52.6%</td>
<td>54.6%</td>
<td>52.6%</td>
<td>50.4%</td>
</tr>
<tr>
<td>8</td>
<td>46.7%</td>
<td>45.9%</td>
<td>47.9%</td>
<td>45.9%</td>
<td>43.7%</td>
</tr>
<tr>
<td>9</td>
<td>39.4%</td>
<td>38.5%</td>
<td>40.5%</td>
<td>38.5%</td>
<td>36.3%</td>
</tr>
<tr>
<td>10</td>
<td>32.1%</td>
<td>31.2%</td>
<td>33.2%</td>
<td>31.2%</td>
<td>29.1%</td>
</tr>
<tr>
<td>11</td>
<td>24.8%</td>
<td>23.8%</td>
<td>25.8%</td>
<td>23.8%</td>
<td>21.7%</td>
</tr>
<tr>
<td>12</td>
<td>17.5%</td>
<td>16.5%</td>
<td>18.5%</td>
<td>16.5%</td>
<td>14.4%</td>
</tr>
<tr>
<td>13</td>
<td>10.2%</td>
<td>9.2%</td>
<td>11.2%</td>
<td>9.2%</td>
<td>7.1%</td>
</tr>
<tr>
<td>14</td>
<td>2.9%</td>
<td>1.9%</td>
<td>3.9%</td>
<td>1.9%</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

Note: The table above shows the percentage of students scoring 60% or higher and the overall average percentage of students by each outcome for different courses.
Figure 4.15 Percentage of Students Scoring 60% or Higher and Overall Average Percentage of Students by Each Outcome
(Continued)

<table>
<thead>
<tr>
<th>Question/course</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manufacturing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100a</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100b</td>
<td>50</td>
<td>50</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>100c</td>
<td>50</td>
<td>50</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>100d</td>
<td>50</td>
<td>50</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td><strong>Supply Chain</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120a</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>120b</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>120c</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td><strong>Human Resource</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>130a</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>130b</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td><strong>Other</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F05</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S06</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F06</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>F07</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F08</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S09</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>S10</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S11</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In Table 4.16, for each course the number of times (semesters) for which at least one question on the written portion of the corresponding course, at least 80% of the students scored 60% or higher during the current ABET review cycle period. In total, there were ten times (semesters) exit exams were offered.

<table>
<thead>
<tr>
<th>Course</th>
<th>ISE 102</th>
<th>ISE 105</th>
<th>ISE 115</th>
<th>ISE 120</th>
<th>ISE 130</th>
<th>ISE 131</th>
<th>ISE 135</th>
<th>ISE 140</th>
<th>ISE 151</th>
<th>ISE 167</th>
<th>ISE 170</th>
<th>Cont. Edu</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>3</td>
<td>6</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>7</td>
</tr>
</tbody>
</table>

As we can see from Table 4.16 that for ISE 105, ISE 115, ISE 120, ISE 130, ISE 135, ISE 151, and ISE 170 courses, the students are not able to retain the fundamental information at the desired level. For ISE 102, ISE 131, ISE 140, ISE 167, and continuing education, the students are able to retain the related fundamental information at somewhat desired level.

Instructors of the ISE 105, ISE 115, ISE 120, ISE 130, ISE 135, ISE 151, and ISE 170 courses spent significantly more time in explaining the fundamental concepts in Fall 2010 and Spring 2011. Whereas, for these courses as well as ISE 102, ISE 131, ISE 140, and ISE 167 courses, the instructors prepared a list of fundamental and important concepts to be retained from the respective courses in Spring 2011. This list of concepts was given to the ISE 195B students to help them get prepared for the exit exam. The ISE faculty felt that lower average percentages for most of the outcomes is due to the nature of exam itself in the sense that it covers 12 ISE core courses and exams are closed book and notes. If the students are given information to focus on to study for the exit exam, then performance on the test can be improved. After all, the goal is the retention of the knowledge and if they can show their ability to retain improves with some help, it is perfectly fine. In Spring 2011, except for ISE 105, ISE 115, ISE 135, ISE 142, and ISE 151 at least 80% of the students scored 60% or higher on at least one question from the remaining corresponding courses. Note that Spring 2011 was the first time ISE 142 questions were asked on the exit exam. In addition, a study guide consisting of a list of topics/concepts from each course for students to focus on was given three weeks before the exam. The faculty came to know, from informal discussions with the students, that the study guide was very useful to the students in order to get prepared for the exam. However, the students also felt that they would have liked to have study guide at the beginning of the semester so that they will have enough time to get prepared for the exam focusing on the study guide information. In Spring 2012, the students will be given the study guide at the beginning of the semester.

The average scores of the questions mapping to each outcome during the current ABET review period and for each outcome the average percent of students that score 60% or higher for those questions that map to the corresponding outcome are listed in Tables 4.17. The average percentage for all but one outcome is significantly less than 80%. For outcome i, the average percent is almost 80%. A large percent of students do realize importance of lifelong learning and how to continue to work at it.
Table 4.1

<table>
<thead>
<tr>
<th>Outcome</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Score</td>
<td>3.14</td>
<td>3.39</td>
<td>3.30</td>
<td>3.75</td>
<td>3.16</td>
<td>2.9</td>
<td>2.87</td>
<td>3.19</td>
<td>3.96</td>
<td>3.43</td>
<td>3.02</td>
</tr>
<tr>
<td>Average % Students Scoring ≥60%</td>
<td>59.55</td>
<td>64.76</td>
<td>66.11</td>
<td>75</td>
<td>63.33</td>
<td>53.81</td>
<td>57.16</td>
<td>59.33</td>
<td>81.10</td>
<td>71.09</td>
<td>59.35</td>
</tr>
</tbody>
</table>

In Figure 4.4, average scores over the current ABET review cycle period are also plotted by each outcome. An average score of 3.0 is 60% of 5 (each exit exam question is graded using a maximum possible score of 5). As we can see from Figure 4.4 that the average score of outcome i is greater than or equal to 3 in almost all the semesters during which exit exam was administered and Table 4.18 shows the number of times the average score by outcome exceeds or almost equal to 3. From Table 4.18 it can be seen that the performance of the students on the student outcomes f, g, and j is the lowest over the ABET review period.

It is important to note from Figure 4.4 that except for outcomes g and j, the average score of each of the remaining outcomes is greater than the average of the corresponding outcomes over the ABET review period. Similarly, from Figure 4.15 it is clear that, except for outcome j, average percentage of students scoring 60% or higher for Spring 2011 is greater than the corresponding outcome average percentage of students scoring 60% or higher over the ABET review period.

Table 4.18: Number of Times the Average Score by Outcome Exceeds or almost equal to 3

<table>
<thead>
<tr>
<th>Outcome</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of times average score exceeds or almost equal to 3</td>
<td>7 of 10</td>
<td>7 of 10</td>
<td>7 of 10</td>
<td>1 of 10</td>
<td>6 of 10</td>
<td>4 of 10</td>
<td>4 of 10</td>
<td>4 of 4</td>
<td>9 of 9</td>
<td>5 of 7</td>
<td>6 of 10</td>
</tr>
</tbody>
</table>
Figure 4.4: Average Exit Exam score Comparison Over the ABET Review Cycle

Average Score Comparison

Outcome

Fall 05
Spring 06
Fall 06
Fall 07
Spring 07
Fall 08
Spring 08
Spring 09
Spring 10
Spring 11
Average
Oral exam scores represent an ability to converse about the topics in the curriculum. The faculty is seeking assurance that graduates will be able to talk about the technical content of the program in addition to being able to solve problems or answer questions put forth on a written exam.

Table 4.18 shows the number of questions for which at least 80% of the students received 60% or higher in the oral portion of the exit exam. The oral exit exams contain 6, 7 or 8 questions. Six out of 10 semesters at least 80% of the students score 60% or higher on at least 50% of the questions. Definitely, the ISE faculty would like to see an improvement in the student performance in the oral portion of the exit exam. A list of fundamental courses as discussed earlier to help students study for the exam will help students perform better by knowing how and what to study for the exit exam.

### Table 4.18: Number of Questions for Which At Least 80% of Students Received 60% or Higher

<table>
<thead>
<tr>
<th>Semester</th>
<th>F 05</th>
<th>Sp 06</th>
<th>F 06</th>
<th>Sp 07</th>
<th>F 07</th>
<th>F 08</th>
<th>Sp 08</th>
<th>Sp 09</th>
<th>Sp 10</th>
<th>Sp 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of questions for which at least 80% of students received 60% or higher</td>
<td>1 of 7</td>
<td>6 of 7</td>
<td>4 of 7</td>
<td>3 of 6</td>
<td>1 of 6</td>
<td>3 of 7</td>
<td>4 of 7</td>
<td>3 of 6</td>
<td>5 of 6</td>
<td>3 of 8</td>
</tr>
</tbody>
</table>

3. Capstone Team Project Report Evaluation

Four team project reports (three teams consisting of three students and one team consisting of two students) from Spring 2010 were selected and rated using the form presented in Table 4.10. The students taking capstone class is a random mix, as far as the skills are concerned. The department felt that reviewing projects from one semester is representative of the performance of the students in the capstone course. Table 4.19 summarizes the ratings by projects and overall average rating by student outcomes. Recall, the rating used for rating the project components is 1 – does not meet, 2 – meets, and 3- exceeds the requirements set in the corresponding project components.

### Table 4.19 Capstone Project Rating by Student Outcome

<table>
<thead>
<tr>
<th>Project</th>
<th>Student Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a</td>
</tr>
<tr>
<td>Project 1</td>
<td>2.78</td>
</tr>
<tr>
<td>Project 2</td>
<td>1.22</td>
</tr>
<tr>
<td>Project 3</td>
<td>2.33</td>
</tr>
<tr>
<td>Project 4</td>
<td>2.11</td>
</tr>
<tr>
<td>Overall Average</td>
<td>2.11</td>
</tr>
<tr>
<td>Percent of projects scoring 70% (score of 2.1) or higher</td>
<td>75</td>
</tr>
</tbody>
</table>

In Table 4.19, average rating by each outcome is summarized by project and overall averages by outcome are presented. From Table 4.19, overall average rating indicates that all the outcomes at least meet the requirements of the project components. However, if we look at individual
projects, for outcomes a, b, c, e, h, and k at least 75% (3 out of 4) of the projects score 70% or above. Similarly, for outcomes f, i and j, 50% (2 out of 4) of the projects score 70% or above. None of the student outcomes is achieved at a desired level of 80% of the projects scoring 70% or above. If we look at another way, in terms of meeting requirements (average score of 2 or above), outcomes a, b, c, e, h, and i are met by 75% of the projects, whereas outcomes j and k are met by 100% of the projects and outcome f by 50% of the projects.

The instructor of the course was aware of the result and focused on improving results for each student outcome during Spring 2011. In spring 2011, there were three groups of students that completed capstone projects. Each group consists of four students. There were seven sections in the reports similar to Spring 2010 reports. Each project outcome was achieved by all the three reports.

4. DAC Assessment

In this section we summarize the minutes of the DAC meeting conducted during the current ABET review period. Specifically, summary focuses on the actions/discussions that took place during the DAC meetings that are relevant to ABET ISE program assessment. Here is the summary by DAC meeting dates in chronological order, with the most recent meeting listed first.

February 25, 2011

ISE department news was announced stating with the ranking of the ISE UG program by US News for non-PhD granting institutions. Faculty accomplishments were announced next with Dr. Freund named in top 50 by Healthcare Information and Management Systems Society (HIMSS) and Dr. Patel recommended for promotion to full professor by department and College. Dr. Tsao is back from his Sabbatical and has been recently named Area Editor in Quality and Reliability area of Computers & Industrial Engineering (C & IE) journal. Dr. Dessouky has been Associate Editor of C & IE since 2007. Several individuals from the department were nominated for College of Engineering awards.

Budget & Enrollment were discussed next. Funding sources: General Fund, Trust Fund, Tower Foundation Fund, and Research Foundation Fund were discussed.

Admissions for Fall 2011 undergraduate and graduate students were discussed.

According to career center 50% of ISE December graduates (18) already had jobs. College number is 35%. The ISE department has received numerous requests for ISE interns from employers and these requests have been posted on our web page.

The ISE department received the Pinson Chair award that is a two-year full-time appointment. This appointment expectation is to teach two courses per semester and assist in development of a new strategic direction of the department. Dr. Freund submitted a one-page proposal to Dean Wei back in September 2010. The ISE proposal is to developing an MSISE specialization in Service Systems Engineering (SSE). The actual award is still pending.
DAC members were asked for advice and input on how to address the Department Strategic Direction. DAC members suggested combining supply chain & service and making emphasis in areas of Energy/Sustainability/Product life and carbon footprint supply chain.

ISE 105/ISE 222 was discussed. DAC members were asked for input feedback, guidance and support. A lot of feedback was given by the DAC members. DAC members suggested students need to take field trips to actual companies so they can get a feel on how everything runs.

IIE student National Conference was discussed. Two students gave a small presentation on Student Development Track developed by SJSU IIE Student Chapter (ISE Club) and to be hosted by the ISE Club. ISE department sponsored two students to attend IERC 2011 Conference to be held in Reno, NV on May 21-25.

An overview of Program Educational Objectives (PEO) and its assessment process were presented. PEO Assessment processes primarily focuses on the results of the alumni surveys conducted every three years. However, DAC members actively participate in defining and assessing achievement of PEOs. End of Fall 2010 a pilot ISE department mentoring program was implemented. Student outcomes assessment processes were also discussed.

Volunteers from DAC industry members to conduct exit survey were identified.

April 16, 2010

ISE program was overviewed. Admission for undergraduate ISE majors is the best in recent time: 38 First Time Freshmen and 27 Undergraduate Transfer students.

It was discussed how the department is implementing the new Direct Assessment for ABET. Alumni Survey was sent to 30 alumni in March as of today we have only received 6. Survey results based on 6 survey respondents were discussed. Various methods that we can engage our Alumni to participate further in our alumni survey were discussed. Industrial and Systems Engineering department was nominated for the Provost Assessment award for the College of Engineering.

Some Emerging Areas in Industrial Engineering, such as Health Care, Transportation systems and Energy/Sustainability/Product life cycle/Carbon Footprint Supply Chain were discussed. It was noted that Health Care is in demand for more ISE professionals, ISE department needs to pursue more opportunities in this field.

Volunteers for administering senior exit surveys were identified from a group of industry DAC members.

April 24, 2009

Several strategies for identifying and connecting with freshmen were discussed and identified. These strategies were:
1. Mentoring by senior ISE students of frosh ISE students. Possible integrated with IIE club officer roles.
2. Start a facebook club for ISE freshmen so they can get in touch with each other and keep in touch with the department
3. Or, consider a LinkedIn group for ISE lower division students
4. Ask them
5. Start some interesting challenges – brain challenges, “how to make a pizza fast” contest

The DAC members felt that by making better connections with the freshmen there will be a two-fold benefit. One is that the freshmen will get better connected with the department and feel at home. Secondly, the senior students as well as alumni will get opportunity to mentor and in turn benefit themselves making them more responsible and realizing the need for lifelong learning.

Two undergraduate student awards were discussed. One new ISE student received Newnan Scholarship of $1,000 and one 4 year Silicon Valley Engineering Scholarship of $4,000 per year to a new ISE freshman student who will be entering Fall 09.

**November 14, 2008**

Engineering graduation rate was discussed. Six –year engineering graduation rate is very low. Transfer graduation rate is more than 2 times as high as SJSU engineering frosh graduation rate. Transfers who graduate mostly stay in the major.

University wide themes were discussed. These themes included improving advising and streamlining curriculum. Specifically, the following topics were discussed

1. taking care of frosh by offering 1-unit “intro to the major” classes, offering 1-unit professional development classes, and getting frosh into student clubs right away were discussed.
2. improving college-level skills by offering workshop classes (E90W, MATH 19W, MATH 30W, etc.) and providing better help for WST problems
3. providing Student organizations leadership training and councils
4. bringing in better-prepared students by offering scholarships

The following undergraduate curriculum changes were discussed:

1. added ISE 142 Service Engineering course to curriculum
2. ISE 155 Supply Chain Engineering course changed from elective to required
3. Developed an Engineering Management minor
4. Developed Statistical Process Improvement minor
5. Enhanced equipment for the ENGR 194 lab to allow for system integration
6. Modified content of ISE 151 Engineering Management and ISE 105 Systems engineering

**April 18, 2008**

Modifications to the ABET Accreditation requirements were discussed related to program educational objectives and student outcomes assessment. Specifically, the need to develop performance criteria and performance measures for student outcomes were discussed.
Senior exit surveys and interviews were discussed. Specifically, process for handling Senior Exit interviews and overview of the results-to-date were presented.

**November 2, 2007**

BSISE curriculum was overviewed and open discussion related to the curriculum took place.

An overview of past findings and impact of senior exit surveys and interviews were discussed.

**April 20, 2007**

Accreditation result and next steps were discussed. Donald G. Newnan Award / Awardee were discussed.

ISE curriculum updates using data/survey rationales were discussed. An overview of past findings and impact of Senior exit surveys and interviews were discussed.

**April 7, 2006**

Feedback from previous exit survey and interviews were discussed. Undergraduate program objectives and program outcomes were discussed.

Draft copy of alumni survey was discussed and improvements to the survey form were recommended by DAC. Next steps for assessing program educational objectives were summarized.

ISE 195A and ISE 195B participation plans were discussed.

**November 4, 2005**

ABET site visit results were discussed. ISE undergraduate curriculum was reviewed. Industry sub-committee report on supporting students in preparing for their job search was discussed.

ABET evaluator review comments were discussed. Discussion in small groups took place regarding assessment tools, assessment processes, role of students and process to assure achievement

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**Indirect Assessment Processes Analysis and Results**

**1. Course contributions to student outcomes**

As described earlier student outcomes survey is distributed to the students every semester for each course to determine their perception in meeting each outcome. A sample survey was presented in Figure 4.1. The student is asked to rate the extent to which the course “increased
their ability or knowledge” relevant to each outcome. Responses are on a scale of A-exceptional (scored as 5) down to E-None (scored as 1). Eleven bar graph charts (Figure 4.5) present the averaged results of this survey since Fall 2005 for each course for each one of the eleven outcomes. The x-axis labels in Figures 4.5 correspond to various course clusters: Manufacturing (ISE 115), Management (ISE 102, ISE 103, ISE 105, and ISE 151), Human Factors (ISE 112, ISE 114, ISE 120, and ISE 164), Supply Chain (ISE 140, ISE 142, and ISE 155), Modeling (ISE 130, ISE 167, and ISE 170), and Quality (ISE 131 and ISE 135), and Capstone (ISE 195A and ISE 195B). Highlighted horizontal line is associated with the average faculty rating of the corresponding student outcome. These results are repeated in a differently grouped presentation in Figure 4.6. In this view, the averaged results for each outcome are grouped together by course. This view presents a perspective of the scores for each outcome for each class over time, with the semesters presented consecutively when the survey was conducted.

In evaluating these results regarding how much each course “increased their ability or knowledge” relative to each outcome, Table 4.20, below, indicates which outcomes were rated at 4.0 or higher on the average for each course (indicated by ‘X’ in the corresponding cells in the table). These data are average results across all instances that the course has been taught (and rated) over the past 5 years. Several courses, highlighted in Yellow, had 4 or more outcomes rated by students at 4 or above. The last column shows the average faculty rating obtained from Table 4.11. When compared with the faculty average rating, except for outcome b, the average rating of the students is greater than the corresponding faculty average rating for each of the remaining outcomes for at least five courses.
Table 4.20 – ISE Courses the students have evaluated an Outcome learned at 4 or higher

<table>
<thead>
<tr>
<th>Course</th>
<th>102</th>
<th>105</th>
<th>103</th>
<th>115</th>
<th>120</th>
<th>130</th>
<th>131</th>
<th>135</th>
<th>140</th>
<th>142</th>
<th>151</th>
<th>155</th>
<th>167</th>
<th>170</th>
<th>195</th>
<th>196</th>
<th>Avg Rating by Faculty*</th>
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</tbody>
</table>

* Average rating of the outcomes by faculty from Table 4.11

Viewed another way, the average of the course survey response data indicates that students perceive all ISE courses address 4 or more program outcomes in a significant manner, except ISE 115, ISE 135, ISE 140, ISE 155 and ISE 170. A Pareto chart indicating the number of significantly rated courses per outcome is shown in Figure 4.5. Except for outcome b, the remaining outcomes are regarded on the average by students as being significantly addressed by 6 or more courses in the curriculum. By significantly addressed, we mean that the average rating of the students for the corresponding courses over the ABET review period is greater than the corresponding average faculty rating.
Figure 4.5 – Average Student Response By Outcome for Each Course (Fall ’05 – Fall 10)

To what extent did this course increase your:

Outcome a: Ability to apply knowledge of mathematics, science and engineering.

Outcome b: Ability to design and conduct experiments, as well as to analyze and to interpret.
Outcome c: Ability to design a system, component, or process to meet desired needs.

Outcome d: Ability to function on multidisciplinary teams.
Outcome e: Ability to identify, formulate, and solve engineering problems.

Outcome f: Understanding of professional and ethical responsibility.

Average Response (F06-S11)
Outcome g: Ability to communicate effectively.

Outcome h: Understanding of the impact of engineering in the global, societal context.
Outcome i: Recognition of the need for, and an ability to engage in lifelong learning.

Outcome j: Knowledge of contemporary issues.
Outcome k: Ability to use the techniques, skills and modern engineering tools necessary for engineering.

Average of all outcomes across all semesters and all courses

Average Response (F06-S11)
Figure 4.6: Overall Average Outcome Results

**Management Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Average Outcome Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>102: Engineering Economic Systems</td>
<td>3.8</td>
</tr>
<tr>
<td>103: Life Cycle Engineering</td>
<td>3.6</td>
</tr>
<tr>
<td>105: Introduction to Systems Engineering and Activity Costing</td>
<td>3.4</td>
</tr>
<tr>
<td>151: Managing Engineering</td>
<td>3.7</td>
</tr>
</tbody>
</table>

**Supply Chain Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Average Outcome Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>140: Operations Planning and Control</td>
<td>3.6</td>
</tr>
<tr>
<td>142: Service Systems Engineering and Management</td>
<td>4.0</td>
</tr>
<tr>
<td>155: Supply Chain Engineering</td>
<td>3.8</td>
</tr>
</tbody>
</table>
Human Factors Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Average Outcome Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>112: Occupational Health Engineering</td>
<td>4.4</td>
</tr>
<tr>
<td>114: Safety Engineering</td>
<td>4.1</td>
</tr>
<tr>
<td>120: Work Methods Design and Measurement</td>
<td>3.9</td>
</tr>
<tr>
<td>164: Human and Computer Interaction</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Modeling Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Average Outcome Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>130: Engineering Probability and Statistics</td>
<td>3.2</td>
</tr>
<tr>
<td>167: System Simulation</td>
<td>3.3</td>
</tr>
<tr>
<td>170: Operations Research</td>
<td>3.7</td>
</tr>
</tbody>
</table>
Quality Courses

Capstone Courses
In Table 4.21 we compare the average rating of the students for those outcomes of each course over the ABET review period that were also rated by the faculty (see Table 4.11 for faculty rating). The first number in each cell represents the faculty rating of the corresponding outcome for a given course (from Table 4.11) and the second rating is the average of the student rating for the corresponding cell over the ABET review period. The cells that have at least as high rating given by the students when compared with the corresponding faculty rating are highlighted. The courses that are poorly rated by the students when compared with the faculty rating are ISE 114, ISE 115, ISE 140, ISE 167, and ISE 170. The instructors of these courses have been informed and are looking into issues related to their courses that might have affected the student rating.

When we look at how well outcomes are rated by the students, Outcome b does not meet faculty expectations as rated by the students. The remaining outcomes have at least 50% of the courses receiving at least as high student average rating as the faculty average rating. Overall, faculty needs to pay attention to outcome b.
Table 4.21: Average Faculty Rating/Average Student Rating over the ABET Review Period

<table>
<thead>
<tr>
<th>ISE Program Outcome</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
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<tbody>
<tr>
<td>Upper Division courses</td>
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<tr>
<td>ISE 102</td>
<td>3.6/3.6</td>
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<td>4.6/4.0</td>
<td>4.0/4.4</td>
<td>4.0/4.0</td>
<td>3.1/3.6</td>
<td>3.1/3.6</td>
<td>3.1/3.6</td>
<td>4.0/4.4</td>
<td>4.0/4.4</td>
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</tr>
<tr>
<td>ISE 105</td>
<td>4.2/3.8</td>
<td>3.4/3.4</td>
<td>4.0/4.0</td>
<td>3.1/3.6</td>
<td>3.2/3.3</td>
<td>3.0/3.6</td>
<td>3.0/3.6</td>
<td>3.0/3.6</td>
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<tr>
<td>ISE 115</td>
<td>4.5/3.8</td>
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<td>3.1/3.6</td>
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<tr>
<td>ISE 120</td>
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<td>3.0/3.4</td>
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<tr>
<td>ISE 130</td>
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<td>3.5/3.9</td>
<td>3.0/3.4</td>
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<tr>
<td>ISE 131</td>
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<tr>
<td>ISE 135</td>
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<td>ISE 140</td>
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Student’s objectives and learning

Two additional questions are asked of students at the completion of each course. They pertain to the importance of the course topics to the student’s educational objectives and the percentage of the material on each topic covered in the class that the student believes he or she has “learned”. The questionnaires used for collecting this information were presented in Figure 4.3.

Results for the first question, pertaining to learning objectives by course are presented in Table 4.22. The scale used by students in responding is Very Important – A (scored as 5) to Not Important – E (scored as 1). As seen in the table, average results over the past several years are typically above 4 (Important) on this 5 point response scale. We have noted that ISE 102, ISE 115, and ISE 130 are below 4 on the average. These scores are attributed primarily to instructional and constituency issues rather than topical content of the courses. ISE 102 (introductory engineering economic analysis course) is technical elective for technology students. Their receptiveness to these topics has been difficult to win. ISE 130 is a mix of ISE, software engineering, computer engineering, and human factors students.
### Table 4.22 – Importance of Educational Objectives

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The overall averages in Table 4.22 are presented graphically in Figure 4.8.
Figure 4.8 – Importance of Education Objectives

How important, to your educational objectives, are the topics in this course?

Course Average Response (F06-S11)

ISE 115  ISE 102  ISE 103  ISE 105  ISE 151  ISE 142  ISE 155  ISE 112  ISE 114  ISE 120  ISE 164  ISE 130  ISE 167  ISE 170  ISE 131  ISE 135  ISE 195A  ISE 195B
The second question about the course topics asked each semester pertains to the percentage of material covered in the topic that the student believes that he/she has learned. Responses are in constructed ranges and are offered as follows: A - >90%, B – 70 – 90%, etc to E - <30%. The responses are scored (valued) at the center of each category and average results for the courses across all topics presented in the course are as shown in Table 4.23. ISE courses 102, 115, 120, ISE 130, ISE 135 and 142 average below 80% across all topics of their respective courses. Issues with the amount perceived to have been learned by students in all the courses have been identified and addressed over the past several semesters, as reflected by the most recent result in the table, except for ISE 130.

Table 4.23 – Percentage of Material Learned

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As above, the overall averages in Table 4.23 are presented graphically in Figure 4.9.
Figure 4.9 – Percentage of Material Learned

What % of the Material Covered on this Topic in this Course do you Feel you Have Learned/Achieved?

Course

Average Response (F06-S11)
From Figure 4.9 it is clear that the students feel that between 80% and 95% of the material in most of the ISE courses they have learned.

3. Teamwork Surveys

Teamwork survey is distributed at the conclusion of projects in six courses during each semester. Many students completed surveys in more than one class. A total of 578 rating sheets were completed by members of 178 different student teams. The 9 items rated by each team member for each other team member were as follows:

1. Availability
2. Completed work on time
3. Helped team organize and plan
4. Was prepared at team meetings
5. Attended planned team meetings
6. Provided high quality content
7. Demonstrated leadership
8. Were (self) / Was (others) an effective team member
9. Would like to work with this team member again (others only)

The first 7 items were rated on the following scale: Never, Sometimes, Often, Always – scored as 1, 3, 5, or 7). The last two items were rated on the scale: Strongly disagree, Disagree, Depends, Agree, Strongly Agree – scored as 1, 3, 4, 5, 7).

The ratings were collected during current ABET review cycle period (Fall 2005 to Spring 2011) and preliminary studies have been completed. As seen in Table 4.24, average ratings on all items are high, with an average of more than 61% being rated at level 7 (or “always” on the response scales used on the form) across all 9 team member performance items. Items 8 and 9 seemed to be more discriminating, with a seven category response scale (Strongly disagree to Strongly Agree). On the whole, however, students completed the forms without difficulty, many writing comments in the area provided to convey additional thoughts about others as team members.

| Table 4.24: Percentage Response Per Score Value: Fall 2005 - Spring 2010 |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Score                          | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | Average |
| 1                              | 0.5 | 0.7 | 1.4 | 0.9 | 0.4 | 0.5 | 2.7 | 1.7 | 3.7 | 1.4     |
| 3                              | 5   | 3   | 4.9 | 3.8 | 2.8 | 3.9 | 10.8| 1.5 | 3.6 | 4.4     |
| 4                              | 3   | 5   | 3.8 | 2.8 | 3.9 | 10.8| 1.5 | 3.6 | 3.6 | 3.6     |
| 5                              | 27  | 23.4| 25  | 23.2| 14.9| 24.1| 31.5| 29.2| 23.5| 24.8    |
| 7                              | 67.5| 72.8| 68.7| 71.6| 81.9| 70.9| 55  | 64.3| 65.4| 68.7    |
| Total No. of Responses         | 934 | 941 | 937 | 939 | 936 | 941 | 714 | 871 | 618 |         |
### Percentage of Response per Score Value - Spring 2006

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### Percentage of Response per Score Value - Fall 2007

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### Percentage of Response per Score Value - Spring 2008

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Total No. of Responses

### Percentage of Response per Score Value - Fall 2008

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Total No. of Responses

### Percentage of Response per Score Value - Spring 2009

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Total No. of Responses

### Percentage of Response per Score Value - Fall 2009

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Total No. of Responses

### Percentage of Response per Score Value - Spring 2010

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Total No. of Responses
Two additional views of these teamwork ratings were conducted. The first looks at the ISE 195A and ISE 195B Capstone Design project ratings side by side (Figure 4.10). Typically, teams formed in ISE 195A continue to work together through ISE 195B. The survey results from the Fall 2005 to Spring 2011 semesters of the questionnaires in these two classes indicate higher teamwork experiences by the teams in ISE 195A at this time than the teams in ISE 195B, except for question 7. Question 7 deals with demonstrated leadership. In ISE 195B, the students take leadership role in different sections of the project report, whereas in ISE 195A no such leadership roles are expected.

Figure 4.10 – Capstone Project Average Teamwork Scores
Teamwork survey data sets were collected from ISE 103, ISE 112, ISE 114, ISE 120, ISE 131, ISE 135, ISE 140, ISE 142, ISE 151, ISE 155, ISE 164, and ISE 167 from Fall 2005 to Spring 2011. The average item scores are depicted in Figure 4.11. Here, we begin to see differences between classes, providing incentive to consider if teamwork responsibilities or protocols established by a particular class may play a part in the student teamwork experience. Question 8 and 9, especially 9 received relatively lower average scores when compared with other questions. Question 8 is about the effectiveness of team member and Question 9 is about would like to work with this team member again.

Figure 4.11 – Other Classes Average Teamwork Scores

4 DAC Senior Exit Survey

The DAC also created and administers senior surveys every semester for students enrolled in senior design. The survey is shown in Appendix E. It consists of questions pertaining to perceived knowledge and abilities, courses in the ISE curriculum, projects in the curriculum’s courses, laboratories associated with ISE courses, faculty and staff, and also provides several opportunities for students to answer open ended questions about department strengths, weaknesses, and potential improvements.

The survey was first implemented Spring 2003. It is administered during a one hour session scheduled to follow the ISE 195 B final project presentations at the end of each semester. DAC members first hand out written copies of the survey to each graduating senior, then follow up with each student immediately with a one-on-one personal interview/questionnaire review. The results of the survey are summarized by DAC members and all answers are provided to the faculty for discussion and consideration.
In reviewing the results, two areas will be the focus of this section: the scores relating to Section I and Section II of the survey. Results pertaining to other sections of the survey, as well as some stratified views of the results (such as most improved, least valued, most valued courses, etc) are presented in Appendix E.

Section I of the survey is seeking the graduating senior’s perception of his/her knowledge or abilities on a 5 point scale relative to areas closely aligned with outcomes a - k. As seen in Figure 4.12 below, students have generally high perceptions across a broad range of topics related to the stated program outcomes. The chart displays the average rating across all items in Section I as marked by all students taking the survey in the semester indicated.

**Figure 4.12 – DAC Senior Exit Survey – Averages for Section I By Semester**

Responses to Section II of the survey pertain to the “value” of courses and the “quality” of labs. These words are in quotation marks because no effort is made in the questionnaire to define either term for the student respondents. Results over the past several semesters (Figure 4.13) indicate that, while the “value” of courses seems to be increasing, there is a need to direct attention to labs in the curriculum. Several initiatives are already underway with regard to lab improvement (See Appendix C).
According to Spring 2011 exit survey comments, the best classes are ISE 140 Operations Planning, 155 Supply Chain, most relevant, 105 System Engineering because it gives a good overall perspective, 120 Work Method Design, it is what the major is about, ISE 170 Operations Research, concrete tools, ISE 142 Services, what the trend is. Also mentioned ISE 130 Statistics for Engineers, ISE 114 Safety Engineering, and ISE 151 Engineering Management.

Classes that need improvements are ISE 115 CIM and lab (have to wait for equipment, spending time debugging and working around equipment that does not work well), CmpE 131 Software life cycle (don't see relevance of the course to ISE), and ISE 102 Engineering Economic Analysis (teacher is inexperienced).

**Senior project related comments:**
First semester is spent practicing making presentations, students should know the project early in the first semester rather than December, and it would be better to have a semester to prepare. Student would like to see more business applications.

**General comments**
Overall pretty satisfied.
Teachers are there, they are pretty approachable, they are good at responding to emails.
Class scheduling is an issue. They are offered only once per year. This forces students to take them out of sequence/order in order to graduate on time.

Opening industry doors is missing. Students would like people from the industry to come and talk about their successes. Increase the link between the university and the industry in Silicon Valley. Only 2 classes had outside people come to talk.

Study guide for the exit exam should be given in December.
The ISE faculty will meet during Summer 2011 to discuss the qualitative comments and address the deficiencies/issues stated in the exit interviews.

**Documentation and Maintenance of the Results**

The results are documented and maintained on the ISE shared drive. Each faculty member has access to it. Faculty members can also upload new results as they become available.

**C. Continuous Improvement**

Describe how the results of evaluation processes for the program educational objectives and the student outcomes and any other available information have been used as input in the continuous improvement of the program. Indicate any significant future program improvement plans based upon recent evaluations. Provide a brief rationale for each of these planned changes.

**Outcome Assessment Process Overview**

Evaluation of achievement of Educational Outcomes and Objectives requires a process of collecting, analyzing and interpreting data. We define the process as including *assessment* ("How well are the outcomes and objectives being achieved?") and *evaluation* ("What changes need to be made to enhance achievement of the outcomes and objectives?") to produce *enhancement*, which is the overall goal.

The ISE program’s assessment, evaluation, and enhancement process is visually depicted in Figure 4.14. It consists of three nested-enhancement-loops. The overall loop is for continuous enhancement of achieving Program Educational Objectives. This is achieved through the Outcomes enhancement loop, which is in turn supported by enhancement of individual courses as well as their vertical integration into the student’s growth in the Program. Briefly stated, achievement of Program Educational Objectives is evaluated in terms of achievement of the supporting Outcomes. Achievement of Outcomes involves the degree to which students meet specified Outcomes Performance Criteria. Outcome achievement is in turn supported by meeting individual course learning objectives while completing the Program Curriculum.
Figure 4.14 – Program Assessment and Enhancement Process Model

- University, College and Department Mission & Goals
- Assessment & Enhancement Of Program Objectives
- BSISE Program Objectives
- Objective Performance
- Alumni Survey
- Program Enhancement
- Evaluation
- Assessment
- Alumni Survey
- Outcomes Notebook
- Program Enhancement
- Outcome
- Course Topics x Outcome Course Evaluations
- Individual Feedback
- Teach Courses
- Plan Courses
- Assemble and process program
- Review Courses
- Graduating Seniors
- Major Design Course
- Exit Survey
- Feedback
- Employers, DAC
- ISE Program
- Entering Students
- Industry Students
- Alumni Faculty
- Advisory Board
- Teach Courses
- Plan Courses
- Assemble and process program
- Review Courses

BSISE Program Objectives
Design of the ISE Student Outcome Assessment Process

Figure 4.14 provided an overview of our overall assessment process, including the program and course-level assessment and enhancement cycles. The process recognizes that the classes that comprise the program are the means for accomplishing the program outcomes. As such, each class is expected to contribute in specific ways to specific student outcomes.

The process of outcomes assessment in the ISE Department is intended to guide progress of the Department, the ISE Program and the individual courses relative to achievement of the Department’s Outcomes. The process revolves around an iterative application of feedback and change toward more effective pedagogy in the areas of study in ISE, in general intellectual development and in preparation for life-long learning.

The Program’s desired outcomes (a – k above) form the goals for which the curriculum is configured and sustained. Using the concepts of continuous improvement, the curriculum is scrutinized at both the philosophical level and the course delivery level to assure that the courses offered, taken together, represent quality and compliance with these outcome statements.

A more detailed view of the Outcomes Assessment and Management Process referred to in Figure 4.14 is presented in Figure 4.15. Beginning at the top of the figure, courses and the entire program are regularly reviewed at the outcome and topic levels using Course Surveys, Sr. Interviews, Sr. Exit exams, and direct assessment of selected core courses using performance criteria for each outcome. Data pertaining to each outcome that is generated by these protocols is analyzed and summarized by outcome, and by class. Faculty members review these results regularly and determine how outcomes can be improved. Following the faculty’s evaluation of all survey, examination, direct assessment of selected core courses and interview data, modifications are made to the plans for each course. The impacts of those plans on the outcomes previously addressed in the course are recorded in the Outcome Mapping Matrix.
Figure 4.15: Outcome Assessment and Management Process

- **Teach classes**
  - Plan and implement course changes and anticipated effects on outcomes

- **Student**
  - Collect data about program outcomes using:
    1. Course surveys
    2. Jr./Sr. surveys
    3. Sr. Exit exam
  - Assessment of course topics by:
    1. Course survey
    2. Sr. interview
    3. Sr. Exit Exam
    4. Direct assessment

- **Plan classes**
  - Update Outcome Mapping Matrix presenting Outcomes covered by (topics in) each course

- **Assemble and process class and program**
  - Analyze and interpret outcomes and course topics data from all surveys and exit interviews
  - Direct assessment data collected from selected ISE core courses
  - Senior exit exam data

- **Input from:**
  - Alumni
  - Advisory Council (DAC)
  - Employers
Summary of assessment-based actions taken/recommended

Table 4.24 presents a summary of improvements resulted from alumni survey and alumni/DAC feedback and achievement of program objectives at desired levels as measured by the corresponding performance measures.

<table>
<thead>
<tr>
<th>Assessment Process</th>
<th>Program Objectives Assessed</th>
<th>Performance Measure</th>
<th>Achievement?</th>
<th>Actions Taken/Recommended</th>
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</thead>
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<td>No action</td>
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</tr>
<tr>
<td>Modified Alumni survey-2010 (rating of the PEOs by alumni)</td>
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<td>Not concretely defined</td>
<td>Cannot judge</td>
<td>Survey questionnaire modified to quantitatively assess all the objectives</td>
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<tr>
<td>Responses to the Questions on the modified survey form</td>
<td>1-6</td>
<td>See Table 4.1</td>
<td>See Table 4.5 and compare it with Table 4.1</td>
<td>Respondents felt that PEO #2 and #4 are not adequately achieved. However, when we look at their responses to the questions on surveys PEO #2 is achieved and PEO #4 is not achieved.</td>
</tr>
<tr>
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<tr>
<td>DAC Members and Alumni Feedback</td>
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<td>Added 142 to ISE curriculum</td>
</tr>
<tr>
<td></td>
<td>1-3*</td>
<td>NA</td>
<td>NA</td>
<td>Added ISE 155 to ISE curriculum</td>
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<tr>
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<td>2*</td>
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<td>NA</td>
<td>Dropped MATH 129A and MATH 133 and added MATH 123</td>
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<tr>
<td></td>
<td>1-2*</td>
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<td>NA</td>
<td>Moved ME/ISE 110 to technical elective list</td>
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<tr>
<td></td>
<td>1-5*</td>
<td>NA</td>
<td>NA</td>
<td>Real world time study project in ISE 120 course</td>
</tr>
</tbody>
</table>

* * Changes implemented to support corresponding PEOs. See Background Section of the report for details.
Table 4.25 presents a summary of improvements that resulted from various direct indirect assessment processes and achievement of outcomes at desired levels as measured by the corresponding performance measures. Please refer to background section for the changes in the curriculum that occurred based on the alumni and DAC feedback during the current ABET review cycle period.

<table>
<thead>
<tr>
<th>Direct Assessment Process</th>
<th>Student Outcome Assessed</th>
<th>Performance Measure</th>
<th>Achievement? Yes/No</th>
<th>Actions Taken/Recommended</th>
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<tbody>
<tr>
<td>Performance criterion and measure for each outcome</td>
<td>a</td>
<td>At least 80% of the students receive 70% or above</td>
<td>Outcome a in Spring 2010 partially achieved initially and then achieved completely in Spring 2011</td>
<td>Spent more time and effort in teaching simplex method in Spring 2011 in ISE 170. Also spent one class on practicing simplex method with the students. The instructor spent more time discussing and presenting problems on the concepts of the probability and on how to calculate probability, mean and variance of a random variable in ISE 130 class.</td>
</tr>
<tr>
<td>b</td>
<td>At least 80% of the students receive 70% or above</td>
<td>Outcome b Almost achieved initially in Spring 2010 and achieved in Fall 2010</td>
<td>More time was spent on the testing of hypothesis topic and more problems related to testing of hypothesis were solved in ISE 130 in Fall 2010.</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>At least 80% of the students receive 70% or above</td>
<td>Outcome c partially achieved in Spring 2010 And achieved in Spring 2011</td>
<td>The instructor of the course ISE 195B spent more time with the students in developing strategic and management plans in Spring 2011</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>At least 80% of the students receive 70% or above</td>
<td>Outcome d partially achieved</td>
<td>The instructor will spend more time in Fall 2011 in ISE 151 key characteristic of effective management.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>At least 80% of the students receive 70% or above</td>
<td>Outcome achieved</td>
<td></td>
<td></td>
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<tr>
<td>e</td>
<td>At least 80% of the students receive 70% or above</td>
<td>Outcome e achieved</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f</td>
<td>At least 80% of the students receive 70% or above</td>
<td>Outcome f partially achieved</td>
<td>The instructor of ISE 151 spent more time in covering informed ethical choices topic in Fall 2010. However, the students do have a good knowledge of professional code of ethics as seen from the assessment results of the professional code of ethics performance criterion. The instructor will spend more time in ethical choices topic in Fall 2011</td>
<td></td>
</tr>
<tr>
<td>g</td>
<td>At least 80% of the students receive 70% or above</td>
<td>Outcome g is partially achieved in Fall 2010</td>
<td>The instructor of ISE 151 will spend more time on discussing about leadership and communication area in Fall 2011.</td>
<td></td>
</tr>
<tr>
<td>h</td>
<td>At least 80% of the students receive 70% or above</td>
<td>Outcome h is achieved in Spring 2011</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i</td>
<td>At least 80% of the students receive 70% or above</td>
<td>Outcome i achieved in Fall 2010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>j</td>
<td>At least 80% of the students receive 70% or above</td>
<td>Outcome j achieved in Fall 2010</td>
<td></td>
<td></td>
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<tr>
<td>k</td>
<td>At least 80% of the students receive 70% or above</td>
<td>Outcome k achieved in Spring 2010 and Spring 2011</td>
<td></td>
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</tr>
<tr>
<td>Senior written exit exam</td>
<td>Average 80% of the students scoring 60% or above during</td>
<td>None of the outcomes, except outcome i was achieved</td>
<td>ISE faculty gave students a list of topics to focus on to study for the senior exit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ABET review cycle</td>
<td>exam in Spring 2011. ISE faculty will give a list of topics at the beginning of Spring 2012 when it will be offered next time.</td>
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<tr>
<td>Capstone Project Report Evaluation</td>
<td>a-k, except outcome d</td>
<td>80% of the projects scoring 70% or higher</td>
<td>None of the student outcomes achieved</td>
<td>The instructor of the course focused on improving the results for each student outcome in ISE 195B in Spring 2011. The performance of the students improved in Spring 2011.</td>
</tr>
</tbody>
</table>
Table 4.25b Indirect Assessment Processes

<table>
<thead>
<tr>
<th>Indirect Assessment Process</th>
<th>Student Outcome Assessed</th>
<th>Performance Measure</th>
<th>Achievement? Yes/No</th>
<th>Actions Taken/Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Contributions to Outcomes</td>
<td>a-k</td>
<td>Average response of at least equal to corresponding average value assigned by the faculty in Table 4.11</td>
<td>All the outcomes, except outcome b are achieved.</td>
<td></td>
</tr>
<tr>
<td>Teamwork Surveys</td>
<td>d</td>
<td>Average rating of 5.6 or higher for each of the nine questions on teamwork</td>
<td>All the questions, except question #7, #8, and #9</td>
<td>In ISE 195A students will be asked to demonstrate leadership (Q7), in ISE 103, ISE 112, ISE 114, and ISE 135 students will be asked to become an effective team member (Q8), and in all the courses it will be emphasized that each student become responsible and effective team member so that the other students in the team would like to work with them in again (Q9)</td>
</tr>
<tr>
<td>DAC senior exit survey</td>
<td>a-k</td>
<td>Average rating of 4 or higher</td>
<td>Almost all Section I questions</td>
<td>The value of the courses seems to be increasing and there is a need to direct attention to labs in the curriculum. ISE 167 lab instructor was replaced in Fall 2009. Since then the rating of the ISE 167 lab has improved.</td>
</tr>
</tbody>
</table>

The Course Binders with their supporting materials will be available at the site visit as will the collected student work. The constituency evaluations to date (Alumni Survey) are reported in Section 4.
D. Additional Information

Relevant material referenced in Sections A, B, and C of this criterion will be furnished upon request.

E. The College of Engineering Strategic Planning Process

The College of Engineering underwent a strategic planning exercise in 2005, entitled Engineering the Vision. This process resulted in a drive towards improving excellence in the College and set the context for significant capital fundraising. That effort resulted in considerable effort towards improving student success by using external resources to create our Engineering Student Success Center (ESSC). Today, we have top-ranked programs, expert faculty, successful graduates with broad and impressive accomplishments, close ties with Silicon Valley industry, and unique global opportunities for our students. Our College of Engineering is a vibrant educational environment. Now we’d like to move from good to great. ISE program has been ranked 3rd by the US News among non-PhD granting institutions.

We are now finishing the next phase of Strategic Planning, which we refer to as Engineering 2015. The new plan is the result of a continuous improvement process to ensure that our college strengthens its commitment to core values, prepares for the challenges of the coming years, and engages in a process of moving from good to great. During AY 2009-10, Dean Belle Wei launched the Engineering 2015 Task Force, in order to engage all stakeholders in open dialogue and envision a future based on no-limitation thinking. This task Force completed its work in Spring 2011.

The Engineering 2015 Task Force was a broadly representative committee comprised of COE faculty and staff, an industry representative, a graduate student, and an undergraduate student. It was charged with the responsibility to "...lay a solid foundation for the future and continue maintaining an environment devoted to excellence and research, despite what may appear to be the current adverse financial climate...” While the Task Force has been convened in an adverse financial climate, the scope of its work is rooted in COE's Vision and Mission, not its budget.

The Task Force reviewed the College's Vision and Mission statements developed in 2004 and affirmed that they are current, valuable, and need no revision:

**Vision:** To be a learning community that empowers its students to better the world through innovative applications of engineering knowledge and skills

**Mission:** To educate new engineers for the new century, who are technically excellent, broadly educated, and socially responsible

The early meetings of the Task Force involved brainstorming and research as the members asked: In the College of Engineering: What do we do? What are we good at? What are we passionate about? Ideas were elicited from faculty, administration, staff, alumni, students and employers, using focus groups and surveys.
Spring 2010 involved:
- Reviewing core values that are essential to the College
- Identifying gaps and opportunities to better prepare our students for a changing future landscape
- Establishing priorities and direction
- Researching benchmark schools
- Considering alternative and innovative models
- Determining strategic strengths to maintain and develop

Inclusive open communication and collaborative processes were significant. There was a sincere desire and drive to have wide-ranging discussion formats in an inclusive environment. The task force members met together regularly as a team and also formed numerous subcommittees to research and report back on, for example, other campus policies, literature on change management, best practices, lifelong learning, Silicon Valley issues, university issues and data, and COE statistics. There was motivation to realistically appraise alternatives and courses of action. Decision making required information, data, statistics, and abundant participation. They met in forums with faculty, chairs, staff, and students, as well as open forums. This comprehensive approach created synergy.

In a nutshell, we determined what are stakeholders most proud of:
- Distinctiveness
- Hands-on education
- Diversity and global outlook
- Silicon Valley connections and spirit

We are the only public engineering university in this entrepreneurial, high tech, world-renowned Silicon Valley. Students and alumni value the education received here as #1. Alumni, students, staff, and faculty value the hands-on education in the College, the cultural and ethnic diversity, and the Silicon Valley location.

Students appreciate good professors and networking with fellow students, but they would like us to further expand our bridges with Silicon Valley. There were also comments about curriculum not being cutting edge. These issues were explored and plans for addressing them are in the Engineering 2015 Plan.

Three broad categories are the heart of the Engineering 2015 Plan:
- Educational Excellence
- Faculty Excellence
- Silicon Valley Connections

Educational Excellence
For continuous improvement, the following are guiding directives as we continue our forward momentum from good to great in Engineering Excellence:
- Empower students for success through excellence in the major.
- Create a supportive atmosphere of engagement, critical thinking, innovation, and success.
● Develop students into responsible graduates who have a thorough understanding of fundamental engineering theory.
● Provide exemplary student support.
● Maintain – and continue to improve—advising. Focus on early intervention to help students improve early and have a greater chance of success and to make sure that the right students are in our program.
● Achieve 15% improvement in the 6-year graduation rate by 2015.
● Assist incoming students through a Frosh Summer Bridge Program.
● Continue to provide opportunities for improved communication between whom?.
● Partner with industry and other college to benefit student learning and transfer technology.
● Work to incorporate open-ended projects in our required classes to improve life-long learning skills and ease the transition to the “real world.”
● Develop Silicon Valley Capstone Projects

Faculty Excellence
The College of Engineering encourages its faculty members to excel in teaching, research, and service and plans to sponsor new Faculty Excellence Programs (FEPs), to which College faculty members apply on a competitive basis. The funding levels and sources, and specific requirements and metrics are under development for Fall 2011 deployment. To help launch the use of performance metrics in encouraging faculty excellence, the Task Force members suggested a small set of measures and grouped them into four categories: teaching, research, service, and “holistic and other.” Each of the first three categories is further partitioned into Above and Beyond vs. Normal sub-categories. For example:

**Teaching**
- winning student projects and external student competitions
- cutting-edge courses
- above-and-beyond advising and supervision of masters projects
- strong record in teaching through pedagogical innovation and leadership

**Research**
- above-and-beyond research for the purpose of creating new knowledge
- external recognition (e.g., grants/awards)
- quality and quantity of publications

**Service**
- above-and-beyond service to external communities, leadership to professional community, invited lecturer of external organization; organize conference, service committee members or officers of professional societies
- long hours with high impact

**Holistic qualities** based on advancing the College vision through:
- Leadership
- Collaboration
- Collegiality
Silicon Valley Connections

Industry Connections are vital. These are key to the distinctiveness of our College. The Dean's Silicon Valley Leadership Symposia have been significant. Expanding these relationships is crucial for who we are as a College. Faculty, staff, students, and alumni appreciate our proximity to Silicon Valley. Alumni, graduate and undergraduate students value industry relevance and are counting on more industry connections. An immediate step is the creation of a multidisciplinary project development team that will work with industry to provide an interdisciplinary senior capstone project that will last for two semesters.

In conclusion, the Task Force looked inward and outward to establish priorities and guidelines to advance the College through Educational Excellence, Faculty Excellence, and strengthening Silicon Valley Connections.