# Signature Page

## ENGG-2008

## I. Team Members

<table>
<thead>
<tr>
<th>Name</th>
<th>Specialty</th>
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<th>Date</th>
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</thead>
<tbody>
<tr>
<td>Derek Wilson</td>
<td>Chair of Budget Committee</td>
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<tr>
<td>Chris Schultz</td>
<td>Curriculum Committee Chair</td>
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<tr>
<td>Blaze Woodlief</td>
<td>Educational Planning Committee</td>
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<tr>
<td>Erik Dunmire</td>
<td>Facilities Committee</td>
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<tr>
<td>Yolanda Bellisimo</td>
<td>Institutional Planning Committee/Academic Senate President</td>
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<tr>
<td>Nick Chang</td>
<td>Instructional Equipment Committee (and Other Expenses)</td>
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<tr>
<td>Sara Mckinnon</td>
<td>SLO Coordinator and Chair of The Program Review Committee</td>
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<tr>
<td>Joetta Scott</td>
<td>Student Access and Success Committee</td>
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</table>

## II. Program Review Committee

<table>
<thead>
<tr>
<th>Name</th>
<th>Committee (Chairs)</th>
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</thead>
<tbody>
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## III. Vice President of Academic Affairs

<table>
<thead>
<tr>
<th>Name</th>
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<tr>
<td>Nick Chang</td>
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## IV. Board of Trustees President

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<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Phillip Kranenburg</td>
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I. Program Definition

* The Engineering Transfer Program is a sub-program within the Physical Sciences Transfer Program, and comprises all of the courses needed by other Physical Science majors (MATH, CHEM, PHYS, ENGL, and various GE courses), plus COMP and ENGG courses (see Figure ENGG PO1).
* Note that courses within the Engineering (ENGG) Discipline represent a small fraction of the Engineering Program. In fact, some engineering students are able to successfully transfer without taking any ENGG courses.

II. Program Purpose

<table>
<thead>
<tr>
<th>Primary Goal:</th>
<th>Secondary Goal:</th>
<th>Other Goal:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree/Transfer</td>
<td>Career/Work Training</td>
<td></td>
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</table>

Primary and Secondary Goals Description:

* The program predominantly serves students who intend to transfer to a university to complete a Bachelor's degree, but occasionally includes students with other objectives (e.g., professional development).
* As with most CC Engineering programs, few students obtain an A.S. degree, since it often requires some additional coursework beyond what is needed for transfer, and since it is of little value professionally for most students.

III. Students Served

Number: Current student data collection at COM makes it impossible to determine with certainty the total number of Engineering Majors. However, surveys conducted by the department in Spring 2005 and Spring 2008 provide an estimate of the number and distribution, as follows (see Figures ENGG PO2a-c for details):

* 95 and 69 total Engineering majors (census unduplicated headcounts) during S05 and S08, respectively.
* 11 and 9 unduplicated students, respectively, in ENGG courses (ENGG 220 & 245).
* 6 and 9 non-ENGG classes, respectively, with more than 25% enrollment from ENGG majors.
* 8 and 5 non-ENGG classes, respectively, that would appear to have single-digit enrollments without ENGG majors.

Demographics: Students enrolled in ENGG courses, when compared to the general COM population, are (see Figure ENGG PO3):

* younger (50-60% are 18-24 years old, vs. 33% for COM)
* similar in ethnic diversity (both about 66% white)
* more often Asian (13% vs. 9% for COM)
* less often African-American (1% vs. 5% for COM)
* less often female (25% vs. 60% for COM)

IV. Program History

The program was well respected and highly enrolled until the late 1980's or early 1990's, at which point, due to unclear reasons, the program was essentially (though not officially) discontinued via the retirement of all full-time ENGG faculty. Although some attempt was made to offer ENGG courses with part-time faculty, these courses were frequently cancelled due to "low" enrollment (~15-20), creating a reputation among the community that the college was no longer committed to offering an Engineering Program. In 2000, a new full-time faculty member was hired, split between engineering and chemistry, in an attempt to resurrect the program. However, due to numerous retirements among Physical Science faculty (85% of dept. faculty retired from 2000-2004, with delayed and only partial replacement), changes in transfer requirements at the state level, and a persistent belief among the community that the program has been discontinued, enrollment in the program (especially in ENGG courses) has never fully recovered.

V. Attachments
Fig ENGG P01. Engineering Program Course Diagram
Fig ENGG P02a. Distribution of Engineering Students
Fig ENGG P02b. Engineering Enrollment Survey S05
Fig ENGG P02c. Engineering Enrollment Survey S08
Fig ENGG P03. Demographic Comparison between ENGG and COM
Student Access and Success
ENGG-2008

I. Program Enrollment

<table>
<thead>
<tr>
<th>How has this changed?</th>
<th>change from</th>
<th>to</th>
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<tbody>
<tr>
<td>Classes (Total)</td>
<td>Fa02</td>
<td>Sp07</td>
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</tbody>
</table>

**Why has this occurred?**
Reduced offerings of 1-unit introductory course (ENGG 110) from each semester to once per year as a result of low enrollment.

**How can the positive results be maintained or the negative results be improved?**
Opportunities may exist to offer the introductory course in coordination with the local high schools (at COM or at the high schools), thereby serving as an effective outreach tool.

**If there are courses you wish to highlight, please describe changes and trends.**
see above

<table>
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<th>How has this changed?</th>
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<th>to</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTES</td>
<td>Sp03</td>
<td>Sp07</td>
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</table>

**Why has this occurred?**
Reflects stable (but low) enrollment in upper-level ENGG courses (220 and 245) which are offered in Spring. Exception occurred in Sp06 when both courses were cancelled due to low enrollment; this coincided with a statewide dip in Engineering FTES.

**How can the positive results be maintained or the negative results be improved?**
Enrollments could be increased through effective outreach and retention strategies. In particular, early identification of and academic advising for engineering students may increase the percentage who "survive" to the upper level ENGG courses.

**If there are courses you wish to highlight, please describe changes and trends.**
see above

<table>
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<tr>
<th>How has this changed?</th>
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<tbody>
<tr>
<td>FTES</td>
<td>Fa02</td>
<td>Fa06</td>
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</table>

**Why has this occurred?**
Approximately 35% decline in FTES from F02 to F07. Primarily reflects decreased enrollment in introductory graphics course (ENGG 125). Increases and decreases in FTES over this time period mirror trends at statewide level in Engineering, though COM decreases are slightly larger in magnitude.

**How can the positive results be maintained or the negative results be improved?**
More effective outreach and recruitment needed to increase number of entry-level engineering students.

**If there are courses you wish to highlight, please describe changes and trends.**
As noted above, most of recent decrease in discipline FTES is due solely to ENGG 125 course. This may in part be due to low quality/recency of software used in course. Maintaining current professional level software would be prohibitively expensive (> $20k per year); unfortunately, Autodesk donates this software free of charge to most local high schools, thereby creating a negative impression of COM for entering students.

II. Faculty Units

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<th>to</th>
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</thead>
<tbody>
<tr>
<td>Faculty Units</td>
<td>Fa02</td>
<td>Sp07</td>
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</tbody>
</table>

**Why has this occurred?**
Decrease of 1 TU annually from F02 to Sp08 due to decreased offering of 1-unit ENGG 110 course from each semester to once per year, due to low enrollments.

**How can the positive results be maintained or the negative results be improved?**

**If there are courses you wish to highlight, please describe changes and trends.**

III. Demographic Trends
Demographic Changes

How has the total of Students changed from to

African-American

Why has this occurred?
Due to small sample size, no statistically significant trends can be determined over time. However, comparison can be made with general COM student population. ENGG has smaller proportion of Black students as compared to COM, 1% vs 5%, respectively.

How can the positive results be maintained or the negative results be improved?

Demographic Changes

How has the total of Students changed from to

Asian

Why has this occurred?
Due to small sample size, no statistically significant trends can be determined over time. However, comparison can be made with general COM student population. ENGG has larger proportion of Asian students as compared to COM, 13% vs 9%, respectively.

How can the positive results be maintained or the negative results be improved?

VI. Student Retention Rates

Student Retention Rate Within The Program (All courses combined)

Retention: % of students completing courses (First Census Roster/Final Grade Roster Total)

Retention has increased by %

Why has this occurred?
Possibly due to gradually more experienced instructor, smaller class sizes, and perhaps to better preparation in lower level MATH and PHYS courses.

How can the positive results be maintained or the negative results be improved?
Maintain quality and standards of preparatory MATH and PHYS instruction.

If there are courses you wish to highlight, please describe changes and trends.

VII. Student Success Rates

Student Success Rate Within The Program (All courses combined)


Why has this occurred?
Overall increase from around 70-75% up to around 80-90% over the past 6 years. May not be statistically significant due to fairly small sample sizes. But if it is, possibly due to smaller class sizes, and perhaps to better preparation in lower level MATH and PHYS courses.

How can the positive results be maintained or the negative results be improved?
Maintain quality and standards of preparatory MATH and PHYS instruction.

If there are courses you wish to highlight, please describe changes and trends.

VIII. Certificates, Degrees, and Transfer

How has the number of awarded changed from to

Transfers

Why has this occurred?
* See Figure ENGG AS8 for data from the CPEC on transfers to UC and CSU.
* In addition to an almost doubling of reported transfers, ENGG was the 8th largest discipline at COM in 2005 in terms of transfers.

How can the positive results be maintained or the negative results be improved?
It is likely that the results can be improved further, following the suggestions offered elsewhere in this review.

If there are courses or awards you wish to highlight, please describe changes and trends.

IX. Justification
Evidence: What data or evidence supports your projected requirements?

The enrollment/access challenges in ENGG courses can be related to trends and causes at a variety of levels:

**National**

1. The total number of engineering degrees awarded nationally has just recently begun to recover after an almost 20-year decline. The percentage of students studying engineering continues to decline steadily (NSF Statistics).
2. The general public has limited understanding of the engineering profession (2004 Harris Poll), and may therefore be unlikely to encourage their children to study engineering.
3. Most K-12 teachers perceive engineering as one of the most difficult fields of study, and as a result believe that engineering is inaccessible to many of their students, especially women and minorities (Engineering in the K-12 Classroom, ASEE).
4. Many students do not receive sufficient training in math and science at the primary and secondary levels in order to be successful in engineering programs.

**State**

1. There is a complete lack of standardization among CA universities in the transfer requirements for engineering. The exact set of transfer requirements for any individual CC engineering student cannot be determined in advance, as it depends upon a complex combination of circumstances, including engineering discipline, transfer university, GPA, ad-hoc waivers, etc. (see Figure ENGG AS3).
2. The Engineering curriculum is characterized by a highly sequential set of courses. Failure to complete any single course on the first attempt may result in long delays in program completion, often leading to dropout (see ENGG Figure AS4).
3. Although enrollments in the 200-level ENGG courses at COM are quite low, they are actually 'above the trendline' for the state when compared to total college size (see Figure ENGG AS5). In fact, COM's Engineering Program is only slightly below the median in terms of the ratio of Engineering enrollment to total college enrollment.

**Local**

1. High school students who are most likely to succeed in the Engineering Program due to a high level of preparation and motivation, are also most likely to go directly to a university rather than to a community college (since cost is not a factor for most Marin students).
2. There is a widespread persistent belief in the community that COM has discontinued its Engineering Program (based upon personal anecdotal experience).
3. There are several nearby CC's (e.g., CCSF, SRJC, LC) which have more robust Engineering Programs, in terms of enrollments, budgets, support services, and variety and frequency of course offerings.

**Internal**

1. Currently, there is no mechanism to identify and advise prospective Engineering students when they first enroll at COM, or to track their progress over time. Because of the complexities of Engineering transfer requirements and scheduling, good academic advising is needed to increase students' chances for successful completion of the program.
2. Most of the facilities, equipment, and computer technology utilized in the Physical Sciences and Engineering programs are outdated and of poor quality, often inferior to what is available at the local high schools. This results in a negative impression among students about the quality of the educational program.
3. Course offerings are extremely limited in terms of both variety and frequency. This limits scheduling flexibility for students, and increases consequences in terms of time-to-completion if a student fails to complete a course or if a course is cancelled.

Attachments:

http://programreview.marin.edu/2008/ASReport.jsp (3 of 4) 7/23/2012 12:48:00 PM
Fig ENGG A5. CCC ENGG Enrollments
Fig ENGG A5b. ENGG Enrollment Survey S05
Fig ENGG A5c. ENGG Enrollment Survey S08
Fig ENGG A5b. ENGG Enrollment Survey S05
Fig ENGG A5c. ENGG Enrollment Survey S08
Fig ENGG A5d. ENGG Enrollment Survey S08
Fig ENGG A5e. ENGG Enrollment Survey S08
Fig ENGG A5f. ENGG Enrollment Survey S08
Fig ENGG A5g. ENGG Enrollment Survey S08
Fig ENGG A5h. ENGG Enrollment Survey S08
Fig ENGG A5i. ENGG Enrollment Survey S08
Fig ENGG A5j. ENGG Enrollment Survey S08
Fig ENGG A5k. ENGG Enrollment Survey S08
Fig ENGG A5l. ENGG Enrollment Survey S08
Fig ENGG A5m. ENGG Enrollment Survey S08
Fig ENGG A5n. ENGG Enrollment Survey S08
Fig ENGG A5o. ENGG Enrollment Survey S08
Fig ENGG A5p. ENGG Enrollment Survey S08
Fig ENGG A5q. ENGG Enrollment Survey S08
Fig ENGG A5r. ENGG Enrollment Survey S08
Fig ENGG A5s. ENGG Enrollment Survey S08
Fig ENGG A5t. ENGG Enrollment Survey S08
Fig ENGG A5u. ENGG Enrollment Survey S08
Fig ENGG A5v. ENGG Enrollment Survey S08
Fig ENGG A5w. ENGG Enrollment Survey S08
Fig ENGG A5x. ENGG Enrollment Survey S08
Fig ENGG A5y. ENGG Enrollment Survey S08
Fig ENGG A5z. ENGG Enrollment Survey S08
Fig ENGG A6. ENGG Program Flowchart
Fig ENGG A6a. ENGG Program Flowchart
Fig ENGG A6b. ENGG Program Flowchart
Fig ENGG A6c. ENGG Program Flowchart
Fig ENGG A6d. ENGG Program Flowchart
Fig ENGG A6e. ENGG Program Flowchart
Fig ENGG A6f. ENGG Program Flowchart
Fig ENGG A6g. ENGG Program Flowchart
Fig ENGG A6h. ENGG Program Flowchart
Fig ENGG A6i. ENGG Program Flowchart
Fig ENGG A6j. ENGG Program Flowchart
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Fig ENGG A6w. ENGG Program Flowchart
Fig ENGG A6x. ENGG Program Flowchart
Fig ENGG A6y. ENGG Program Flowchart
Fig ENGG A6z. ENGG Program Flowchart
Fig ENGG A7. Demographic Comparison
Fig ENGG A7a. Demographic Comparison
Fig ENGG A7b. Demographic Comparison
Fig ENGG A7c. Demographic Comparison
Fig ENGG A7d. Demographic Comparison
Fig ENGG A7e. Demographic Comparison
Fig ENGG A7f. Demographic Comparison
Fig ENGG A7g. Demographic Comparison
Fig ENGG A7h. Demographic Comparison
Fig ENGG A7i. Demographic Comparison
Fig ENGG A7j. Demographic Comparison
Fig ENGG A7k. Demographic Comparison
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Fig ENGG A7v. Demographic Comparison
Fig ENGG A7w. Demographic Comparison
Fig ENGG A7x. Demographic Comparison
Fig ENGG A7y. Demographic Comparison
Fig ENGG A7z. Demographic Comparison
Fig ENGG A8. Retention and Success Rates
Fig ENGG A8a. Retention and Success Rates
Fig ENGG A8b. Retention and Success Rates
Fig ENGG A8c. Retention and Success Rates
Fig ENGG A8d. Retention and Success Rates
Fig ENGG A8e. Retention and Success Rates
Fig ENGG A8f. Retention and Success Rates
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Fig ENGG A8w. Retention and Success Rates
Fig ENGG A8x. Retention and Success Rates
Fig ENGG A8y. Retention and Success Rates
Fig ENGG A8z. Retention and Success Rates
Fig ENGG A9. Transfers by Discipline 01-05
Fig ENGG A9a. Transfers by Discipline 01-05
Fig ENGG A9b. Transfers by Discipline 01-05
Fig ENGG A9c. Transfers by Discipline 01-05
Fig ENGG A9d. Transfers by Discipline 01-05
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Fig ENGG A9q. Transfers by Discipline 01-05
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Fig ENGG A9v. Transfers by Discipline 01-05
Fig ENGG A9w. Transfers by Discipline 01-05
Fig ENGG A9x. Transfers by Discipline 01-05
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Fig ENGG A9z. Transfers by Discipline 01-05
## I. Projected Course Actions Report

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<tr>
<td>Deletion</td>
<td>ENGG 126</td>
<td>Intermediate Engineering Graphics</td>
<td>Course no longer offered. Consider whether to delete or revise.</td>
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<tr>
<td>Deletion</td>
<td>ENGG 150</td>
<td>Construction Engineering: Materials and Methods I</td>
<td>Course is no longer offered.</td>
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<tr>
<td>Deletion</td>
<td>ENGG 151</td>
<td>Construction Engineering: Materials and Methods II</td>
<td>Course is no longer offered.</td>
</tr>
<tr>
<td>Deletion</td>
<td>ENGG 156</td>
<td>Intermediate Technical Drawing, with Intro to CADD</td>
<td>Course is no longer offered.</td>
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<tr>
<td>Addition</td>
<td>ENGG 206</td>
<td>Programming in MATLAB for Engineers</td>
<td>Will replace COMP 150A/COMP 150B two-course Excel &amp; MATLAB sequence with a single 3-unit MATLAB programming course to improve articulation (will be more parallel to standard university courses).</td>
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<td>Deletion</td>
<td>ENGG 256</td>
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## II. Projected Certificate/Degree & Other Actions Report

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Certificate/Degree Title:
### A.S. in Engineering Technology, Occupational

| Degree | Revision | 15-19 Courses | 63.0 |

**Certificate/Degree Title:**
A.S. in Engineering

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#### III. Attachments

**Evidence:** What data or evidence have you provided? Please briefly describe.
*see attachments below for evidence to support current offerings and necessity of degree revisions.

**Attachments:** Description of attachment formats (file type, hard copy, etc.)

- Fig ENGG CC1. F06-F08 Blueprint and 02-06 Historical Offerings
- Fig ENGG CC2. ABET Program Outcomes
- Fig ENGG CC3. A.S. Degree Requirements
- Fig ENGG CC4. Engineering Transfer Curriculum

College of Marin Program Review Curriculum and Articulation Report - CG v.2 June 2008
## I. Instructional Equipment/Materials Requirements

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**Expense Item:**
Existing equipment budget which allows some minor upgrading and replacement of equipment in absence of major equipment modernization funding.

**Shared With:**
Some equipment shared with Physics Discipline (same Dept).

**On-going Expenses:**
Regular replacements and upgrades.

**Additional Justification for this Item:**

<table>
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<th># of</th>
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<td><strong>Unit Cost</strong></td>
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<td><strong>Tax</strong></td>
<td><strong>S&amp;H</strong></td>
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**Expense Item:**
Existing supplies budget which allows annual purchases of consumable supplies for Engineering courses and routine maintenance of lab equipment.
Shared With:
Sharing of some materials with Physics Discipline (same Dept).

One-time Expense:

On-going Expenses:
Annual supply purchases
Maintenance and repair parts for equipment

Additional Justification for this item:

<table>
<thead>
<tr>
<th>Priority</th>
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<th># of</th>
<th>Support</th>
<th>Application:</th>
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Unit Cost

<table>
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</thead>
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<td>1200.0</td>
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<td>120.0</td>
<td>100.0</td>
</tr>
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</table>

Expense Item:
Laptop computer for laboratory use.

Shared With:
Will be shared with Physics.

One-time Expense:

On-going Expenses:
Possibly IT time at installation/setup.

Additional Justification for this item:

In order to create a more modern learning environment for Engineering students, we have gradually upgraded some of the equipment in the Materials Science and Electrical Circuits laboratory with digital interfaces. To date, these interfaces have been coupled to a very old (circa 1997) desktop computer and monitor on a cart. The age and size of this computer has limited the range of activities that can be performed. A new laptop computer would greatly enhance the experience for students, and increase the range of activities that can be performed with both existing equipment and potential low-cost additional upgrades.

In order to provide the greatest long-term usefulness, this laptop should have high performance capabilities (e.g., 8GB RAM, dual processors, high capacity hard drive, etc.), as well as both USB and serial ports. This will maximize its usefulness for a range of engineering hardware and software applications (e.g., materials and electronic testing equipment, engineering simulation software, 3D graphical design and analysis software, etc.).
Expense Item:
Muffle Furnace (for heat treating materials specimens)

Shared With:

One-time Expense:

On-going Expenses:

Additional Justification for this item:
This item is needed to replace antique, unreliable, and unsafe furnaces for thermal treatment of specimens in Materials Lab course. (Actually we could really use 2 of these, but due to cost, we can try to get by with one for a while and hopefully get a second in the future.) Thermal treatment of specimens is a central component of the laboratory portion of the Materials Science course, which is a required transfer course for students in most disciplines of Engineering. There is currently only one operational furnace (circa 1975-1980) for thermal treatment; it is too small for the samples that must be placed in it, creating safety hazards for students. Additionally, the interior lining has begun to decompose in recent years, posing additional hazards.

II. External Funds/Resources

III. Student Material Fees Funds

IV. Expense Justification

Evidence: What data or evidence have you provided? Please briefly describe.
*See attachment Fig ENGG IE1 for national level support of stated outcomes.
*See attachment Fig ENGG IE2 for past regular ENGG budgets for equipment and supplies.

Attachments: Description of attachment formats (file type, hard copy, etc.)
Figure ENGG IE1. Program-level outcomes from national Accreditation Board for Engineering and Technology (ABET) that support requirements.
## I. Program Faculty

<table>
<thead>
<tr>
<th>Last Name</th>
<th>First Name</th>
<th>Status:</th>
<th>Years at COM:</th>
<th>Faculty Units:</th>
<th>Reassigned Units:</th>
<th>Year Retired:</th>
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<tbody>
<tr>
<td>Banos</td>
<td>Robert</td>
<td>Adjunct, ETCUM</td>
<td>3</td>
<td>6.2</td>
<td>0.000</td>
<td></td>
</tr>
</tbody>
</table>

**Specialty:**
Graphics

**Leadership:**
- currently Academic Senator and Facilities Planning Committee (previously served as Interim Dean, Chair, Budget Committee, Data Acquisition Group).

## II. Instructional Support Staff

## III. Teaching Unit Requirements

### Teaching Units:

#### Health and Safety

#### Scheduling

#### Title 5

#### Waitlists

#### Specialty:

#### Other:
Existing TU allocation. Required for minimum possible programmatic offerings (all of these courses are required for transfer, and are offered only once per year).

- ENGG 110 - 1.00 F
- ENGG 125 - 6.20 F
- ENGG 235 - 3.00 F
- ENGG 220 - 3.00 S
- ENGG 220L - 2.49 S
- ENGG 245 - 4.49 S

### Teaching Units:

#### Health and Safety

#### Scheduling

#### Title 5

#### Waitlists

#### Specialty:

#### Other:
We should ideally begin to offer, in 2009-2010, the 'freshman' ENGG 110B Introduction to Engineering Design course, which was approved a number of years ago, but has never been offered (due to lack of available staff and/or funding). This course would provide the following benefits:

1. Allows us to completely address all program-level SLO's, some of which are incompletely addressed by existing curriculum (especially those SLO's related to practical design skills, teamwork skills, and awareness of societal context).
2. Helps to meet transfer requirements for an increasing number of engineering students added by a number of universities (e.g., course is equivalent to SFSU ENGR 106, SJSU ENGR 10, UCB ENGIN 10, all of which are now graduation requirements).
3. Provides an opportunity for students to more completely explore the excitement and rewards of 'real' engineering work, thereby providing greater motivation and context for the rigorous engineering academic requirements to follow.
4. Provides the only logical setting in which to deeply expose engineering students to sustainability concepts, and to the important role of engineering in the larger societal context.
As indicated in the attachments, all Engineering majors are required to take at least one computer programming course to transfer. For most types of Engineering students, this need will in the future be met by a new ENGG/COMP 206 course, which is a 3-unit replacement of the currently offered COMP 150A/150B (4-unit) sequence (and therefore does not represent a new addition of units). It is not critical whether these 3 TU are offered under ENGG or COMP (the units have historically been listed under COMP), but it is critical that the course be offered to allow Engineering students an opportunity to transfer.

As indicated in the attachments, some engineering students (especially those in Electrical or Computer Engineering) are required to take a number of computer science courses in order to transfer (e.g., COMP 160, 220, 230, 235). Although these courses are listed under a different discipline, if such CS courses are not offered (or are cancelled), the transfer opportunities of these Engineering students will be diminished or eliminated.

### IV. Projected Staff Requirements

### V. Faculty Requirements

1. **No full time instructors in the subject area.**

   While the Engineering discipline itself is not necessarily in need of a full-time faculty member, the overall lack of full-time faculty in the Physical Sciences Department severely impacts the Engineering program. As a result of both retirements (especially in physics and astronomy) and enrollment growth (primarily in chemistry) in 2000-2005, less than 30% of departmental TU are currently (08-09) being taught by full-time faculty. This places a heavy burden upon the few remaining FT faculty in the department, not only in terms of completing 'extracurricular' responsibilities (e.g., program review, curriculum revision, participatory governance, etc.), but also in terms of recruiting, screening, and managing the large numbers of PT instructors needed to staff classes in these disciplines, while trying to maintain quality and consistency of instruction. This situation is gradually eroding the quality of all of the disciplines within this department.

2. **Non-Availability of part-time instructors in a subject area.**

3. **Reduction in department Teaching Units as a result of full-time faculty retirements or other significant causes.**

4. **Recent or forthcoming growth as a result of additional sections of classes to enrollment demands.**

5. **Temporary growth in department Teaching Units as a direct result of a short-term grant or other interim resource.**

6. **Current or forthcoming changes that illustrate the immediate need of additional full-time faculty within this department.**

7. **Program Review findings.**

8. **Other considerations.**

### VI. Attachments
Evidence: What data or evidence have you provided? Please briefly describe.

As shown in attachments ENGG TU2, TU3, and TU4, all of the ENGG courses offered are required in order to meet COM and national program-level SLO's, to satisfy the requirements for the A.S. Degree in Engineering, and to meet transfer requirements, respectively.

Each of the courses is offered only once per year. As shown in ENGG TU1, these offerings have not varied significantly over recent years, except for the recent addition of a lab component (ENGG 220L) to the Circuit Analysis course that was needed to address a deficiency in meeting transfer requirements.

*see attachments below for evidence to support current offerings.

Attachments: Description of attachment formats (file type, hard copy, etc.)

Fig ENGG TU1. F06-F08 Blueprint and 02-06 Historical Offerings

Fig ENGG TU2. ABET Program Outcomes

Fig ENGG TU3. A.S. Degree Requirements

Fig ENGG TU4. Engineering Transfer Requirements
# Facilities General

## ENGG-2008

### I. Current Offices

<table>
<thead>
<tr>
<th>Office</th>
<th>Use</th>
<th>Shared Office</th>
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### II. Preferred Instructional Rooms

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<th>Students/Section</th>
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<tbody>
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<tr>
<td>Room:</td>
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<td>Sections/Year</td>
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<td>T</td>
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<tr>
<td>Facility has limitations:</td>
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<td></td>
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</tr>
</tbody>
</table>

| Room: | Type: | Sections/Year | Students/Section |
| Subject | Course# | M | T | W | R | F | S | U | Start Time | End Time | Fa | Sp | Su |
| ENGG  | 220 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | 1240 | 1400 | ☐ | ☐ | ☐ | Lack of Smart classroom |
| Facility has limitations: |

| Room: | Type: | Sections/Year | Students/Section |
| Subject | Course# | M | T | W | R | F | S | U | Start Time | End Time | Fa | Sp | Su |
| ENGG  | 220L | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | 1410 | 1700 | ☐ | ☐ | ☐ | Lack of Smart classroom |
| Facility has limitations: | Engineering Lecture/Lab Room |
### Program Review

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#### Subject

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Start Time: 0940  
End Time:   1100

**Facility has limitations:**

Lack of Smart classroom

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#### Subject

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Start Time: 0810  
End Time:   1100

**Facility has limitations:**

Lack of Smart classroom

---

### III. Instructional Support Spaces

(Storage, Conference Room, etc.)

---

<table>
<thead>
<tr>
<th>Room:</th>
<th>Purpose:</th>
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### IV. Justification for Projected Facility Requirements

#### Primary Goal:

Degree/Transfer

#### Secondary Goal:

Career/Work

#### Other Goal:

Training

**Application:** Please indicate how the projected requirements will be applied.

Computer Projection needed in SC111 to allow use of computer for presentation and demonstration to students during lecture and lab (not only Powerpoint, but also a variety of software tools that students need to learn how to use).

**Instruction:** How will instruction be improved for Student Learning and Success?

Better incorporation of visual imagery  
Discussion of data collection and analytical techniques  
Demonstration of modern engineering software tools etc.

**Access:** How will access be improved for Student Learning and Success?

Increased use of multimedia for a variety of learning styles.

**Outcomes:** What Student Learning or other outcomes are expected?

Improved problem solving skills  
Greater proficiency in using technology  
Better understanding of conceptual material

**Assessment:** How will the outcomes be measured for future planning?

Exam scores  
Assignments  
Lab reports  
Observation of student performance  
Retention rates

**Evidence:** What data or evidence supports your projected requirements?

NA

---

**Attachments:**

<table>
<thead>
<tr>
<th>Current Blueprint</th>
<th>Room Plans</th>
<th>Room Chart(s)</th>
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I. Institutional Excellence. The Board believes that superior results originate in high aspirations. Therefore, the Board's basic and most important goal for the College is to excel in every activity it undertakes. By so doing, it will achieve a position of local, state and perhaps even national prominence.

Objective 1:
We have always engaged in a constant cycle of self-assessment and improvement in order to provide the best possible educational opportunities to students. This includes:

1. Maintain a well articulated and up-to-date transfer curriculum.
2. Provide a complete and dependable set of course offerings needed by students for transfer.
3. Schedule courses so as to avoid conflicts with other program courses in Math and Sciences, and to provide maximum flexibility for students.
4. Advocate for higher full-time/part-time faculty ratio within department.
5. Recruit highly qualified instructors for part-time assignments.
6. Work closely with Math, Chemistry, and Physics faculty to ensure continuity of learning outcomes among sequential courses.
7. Incorporate appropriate instructional innovations to improve attainment of learning outcomes.
8. Maintain strong relationships with university engineering colleagues via annual ELC meetings and other professional conferences.

As a result of past program review, we have:

- made explicit our program-level student learning outcomes
- made changes in course instruction to further improve alignment with these SLO's (e.g., adding more team design-oriented projects)
- begun review and revision of some of the curriculum as needed. (For example, we have recently submitted a revised computer programming course which will meet transfer requirements for the majority of engineering students, and which should create better clarity for both students and articulation officers relative to existing courses.)
- created a webpage for the Engineering Program which increases awareness, and which provides students with much-needed information about curriculum, transfer requirements, and the general profession.

We believe that to further improve the health of the Engineering Program, the following are needed:

- increased ratio of full-time to part-time faculty for the Physical Sciences Department
- vigorous and institutionally-supported outreach effort to promote awareness of the program, increase interest in the Engineering profession, and establish partnerships with industry
- improved matriculation process to identify potential Engineering students and to provide ongoing academic advising to improve transfer success
- consider creation of a "niche" market for program (e.g., energy systems, sustainable design, etc.) that could improve visibility of program and target transfer efforts to a smaller array of university programs
Objective 2:
Although we do not have access to the necessary post-transfer data to confirm this quantitatively, anecdotal evidence suggests that our students excel after transfer, usually exceeding the performance of other transfer students and of 'native' students who started as freshman at 4-year institutions. Virtually all of our Engineering students who complete the upper ('200') level courses successfully transfer, often to their 'first-choice' institution. Again, based upon anecdotal evidence, most of our students appear to complete their Bachelor's Degrees, and many have gone on to obtain graduate degrees in Engineering (including several each at UC Berkeley, UC Davis, and Stanford).

In terms of enrollment, there has for many years been concern about the low levels of enrollment in ENGG courses, especially the upper level courses. Although we certainly can and should make efforts to increase these enrollment levels (e.g., see recommendations above), recent analysis suggests that COM's Engineering enrollments are typical of other CCC Engineering programs, when normalized by overall college size (see attached), suggesting that low ENGG enrollments are largely due to the small size of the college as a whole. In addition to working at the 'local level' to increase overall COM enrollment, there exist a number of problems at the statewide level that need to be addressed in order to improve Engineering transfer education, and COM may therefore need to play an advocacy role in order to significantly improve this situation.

Attachments:
Fig ENGG CG1. Statewide Comparison of CCC Engineering Enrollments

II. Academic Excellence.
The College must offer its students rigorous, high-quality curricula including degree and certificate programs in lower division arts and sciences and in vocational and occupational fields; remedial instruction; English as a Second Language instruction; support services which help students succeed at the postsecondary level; adult noncredit education; and community services courses and programs, in keeping with state mandates. Academic excellence in all of the College's curricula and support services is at the core of the College's environment. The curricula must remain current and challenging.

Objective 1a:
- The COM Engineering Program offers a complete set of lower-division courses that are standard among CC Engineering Programs, and that allow students to successfully transfer to most universities in the state to complete their Bachelor's Degree in Engineering (see attachment).
- These courses cover content that is both current and relevant, at a high level of rigor, resulting in excellent articulation of courses with most UC and CSU programs.
- We offer students plentiful opportunities for hands-on and project-oriented learning, and wherever feasible, provide students with exposure to modern equipment and instrumentation.
- Academic standards in these courses are maintained at an appropriately high level, which has ensured that students are successful in subsequent stages of their COM study and in their academic pursuits at the upper division, and often graduate, level.
- Courses are scheduled in collaboration with other math and science faculty to ensure that students have access to all courses needed for their program of study.

Objective 1b:

Attachments: Fig ENGG CG2. Engineering Transfer Curriculum

III. Faculty and Staff Excellence.
For the College to excel, it must attract and maintain a faculty and staff of the highest quality, one that functions within an environment of professional development and renewal, and one that focuses on and values the teaching and learning process.
Objective 1a:
The sole full-time faculty member in Engineering:

- has a high quality academic 'pedigree', including: B.S., M.S., and Ph.D. Degrees in Engineering from highly recognized Engineering institutions (University of Florida and UC Davis), post-doctoral research and teaching experience from one of the world's top Biomedical Engineering departments (Duke University), and authorship of peer-reviewed journal publications
- has been invited to Teacher Appreciation Dinner on many occasions
- frequently provides informal academic and career advising to students when solicited
- has written numerous recommendation letters for students
- has received considerable positive feedback from former students about the quality of instruction and the excellent level of preparation they received
- has helped to produce transfer engineering students that went on to considerable academic and professional success after COM
- regularly reads educational and engineering-related periodicals and literature.
- recently completed sabbatical project researching energy sustainability, and completed a graduate-level course in Strategic Sustainable Development
- regularly communicates with Engineering colleagues at other CC's and attends relevant regional and statewide meetings.
- has been active within the institution, including service as Department Chair, Interim Dean, Academic Senator, and a variety of committee memberships.

Objective 1b:

Attachments:

IV. Community Responsiveness. The College must offer broad curricula to meet the needs of students. It must select areas of special interest and need to the communities it serves.

Objective 1a:
Our program objectives in this regard are to:

- Cultivate educational outreach partnership with K-12 community to promote preparation for and interest in engineering study.
- Incorporate important contemporary issues wherever possible into ENGG courses.
- Modify existing courses or develop new courses in response to major new trends in society or in engineering education.
- Participate in outreach and support initiatives aimed at increasing students from underrepresented groups in science and engineering.
- Cultivate partnerships with local industry to inform our educational efforts, provide additional opportunities for students, and seek resources to pursue mutually beneficial initiatives.
- Serve as an active, beneficial, and respected member of our local community.

As evidence of some previous efforts in this regard, the FT Engineering faculty member:

- regularly communicates with Engineering colleagues at other CCC's, and attends regional and statewide meetings (e.g., IMPAC, ELC, and ASEE).
- is active within the community (e.g., attending local city council meetings, participating in countywide climate change mitigation efforts, attending 'Friday Forum' speaker series on local Marin issues, etc.).
- has worked with local agencies (e.g., Friends of Corte Madera Creek) to support their efforts and enlist COM students in research projects.
- helped to create a Math Tutoring program in which COM students provided math support to local K-12 students.
- participated in development of two public COM science museum exhibitions that engaged (among others) children and teachers from local elementary schools.
supervised Independent Study project for advanced high school student who wished to pursue project-based learning that did not fit into standard high school or COM curriculum.

worked with COM Outreach Coordinator to successfully plan and execute a major Engineering outreach event in 2003 which brought together H.S. students and teachers, University Engineering representatives, and Engineering professionals from the local community, for a full-day of activities on the COM campus. Since 2003, have sought on several occasions institutional support to repeat such an event, but have as yet been unsuccessful in getting approval.

has in the past advertised the ENGG 110 Engineering Careers class to local High School science and math teachers, resulting in a substantial number of co-enrolled H.S. students in the course.

together with several other Math and Physical Science faculty, solicited and were awarded an Educational Excellence grant to plan and execute an outreach effort to the area high schools. Unfortunately, all of the participants in the project were unexpectedly "called to service" in other institutional capacities (Interim Dean, Academic Senate V.P., Department Chair, etc.), which precluded them from completing the project. It is likely that a similar effort could be revived if institutional support is still available.

Objective 1b:

Objective 1c:

Attachments:

V. Diversity. The community college is the primary opportunity for people of great diversity to come together for growth and development. The College has an absolute obligation to bring together people of different ages, races, and ethnic backgrounds, male and female, at different levels of development, in an atmosphere of equal opportunity and tolerance.

Objective 1a:
The program (and departmental) faculty:

- support initiatives aimed at increasing students from underrepresented groups in science and engineering.
- Create welcoming and interactive classroom environments in which students are encouraged to ask questions and are challenged to maximize their learning potential. (This is currently aided by small class sizes.)
- make themselves accessible to students outside class, not only to answer course-related questions but also to provide guidance to students regarding academic and professional aspirations, and to aid students in attaining their goals by writing recommendation letters, etc. (This will be easier to achieve with a higher proportion of full-time faculty in the dept.)

Objective 1b:

Objective 1c:

Attachments:

VI. Fiscal Responsibility. The Board and the Administration must operate the College in a fiscally sound way. Together, they must limit expenditures to those that relate directly to the College’s mission, goals and objectives; maintain a prudent level of reserves; and generate new sources of revenue to supplement state funding allocations.

Objective 1c:

Attachments:
VII. Develop and implement sound and coordinated planning processes. Develop and implement sound and coordinated planning processes, utilizing data gathered through Program Review, and other data sources, to support institutional, instructional, and student support service goals, and to promote achievement of student learning outcomes.

Objective 1a:

- Coordinated scheduling takes place each semester with other Physical Science disciplines as well as with the Math and Life & Earth Science Departments to ensure conflict-free schedules for students.
- Engineering faculty member consults weekly with Department Chair regarding matters of hiring, budget, scheduling, curriculum, and other departmental matters.
- Resources are frequently shared between the Engineering and Physics disciplines.
- Engineering faculty frequently discuss with physics and chemistry faculty the performance of engineering students with respect to skills or concepts that were addressed in fundamental courses.

Objective 1b:

Objective 1c:

Attachments:

VIII. Create a physical environment that is inviting to students, generates pride in the community, adheres to green principles, and supports the College’s Mission, Goals and Initiatives.

Objective 1c:

Attachments:
I. Program Excellence (Best Practices)

Briefly summarize examples staff/faculty, institutional, and academic excellence.

The current Engineering Transfer Program successfully:

- maintains an appropriate (albeit minimum), well scheduled, and completely articulated set of course offerings that allows students to complete engineering transfer requirements.
- achieves high levels of retention and success within the ENGG discipline courses.
- appears to achieve relatively high transfer rates and post-transfer student success.

II. Program Resources (Responsiveness)

Briefly summarize examples of key resources required for your program to meet or exceed the college goals (as cited in this review).

Despite apparent success in preparing students academically for transfer, the Engineering Program, especially the upper level ENGG courses, have been plagued by low enrollments for some time. While these enrollments are low in absolute terms, they are actually about average for CCC's in relation to overall college size, reflecting statewide systemic problems associated with engineering transfer education in CA. Nevertheless, any success in increasing these enrollments would bring considerable benefits to the ENGG program, to other math and science programs, and to the college as a whole (and, in a more indirect sense, to the county, state, and nation by increasing the number of domestically trained engineers).

OUTREACH--One obvious strategy, which is being pursued by colleges and universities around the U.S., is to enhance our K-12 outreach activities in order to promote both the engineering profession generally, and COM's Engineering Program specifically. An effective outreach program will require planning and a sustained commitment to provide adequate institutional support.

MATRICULATION--Additionally, since there appears to already be a substantial number of self-declared Engineering majors at COM, better identification, advising, tracking, and support of students could help to increase the percentage of those students who appear in ENGG courses, as well as help to clarify the academic pathways and existing barriers that may explain this apparent discrepancy.

INSTRUCTIONAL EQUIPMENT--As professions and as academic fields of study, the physical sciences and engineering are equipment intensive; consequently, adequate and predictable funding is essential to maintaining modern equipment inventories for both laboratory and "lecture" purposes. Modernizing equipment in all of the physical science disciplines will not only improve our ability to achieve learning outcomes, but will also likely lead to higher enrollments as a result of the improved student perception of our programs.

FACULTY--Any future expansion of ENGG offerings would necessitate additional full-time faculty hiring, at least within the department (to shift loads) if not the discipline. There is currently only one FT faculty member (Erik Dunmire) who is assigned less than half his teaching load to engineering, and who is often called upon to serve in other non-instructional capacities (e.g., Interim Dean, Department Chair, etc.). Because of the complexity of curricular requirements, instructional equipment, course scheduling, etc., maintaining a functional Engineering program requires considerable non-instructional work that can only be carried out by a FT faculty member. While it is not uncommon in CC's to share Engineering faculty with other Physical Science disciplines (e.g., Physics, Computer Science, Chemistry), the current dearth of faculty in the Physical Science Dept (less than 40% of units taught by FT instructors) tends to pull faculty away from, rather than toward, service to the Engineering program.

III. Moving Forward Objectives (Planning)

Briefly summarize examples of data-driven and coordinated planning to improve student enrollment, learning and success.
Strategy 1: Increase "self-awareness" via improved data gathering, in order to support decision making.

a) Improve student data collection, management, and documentation practices within ENGG courses so as to enhance and streamline assessment of course-level and program-level SLOs.

b) Work with the college to improve student data collection practices and matriculation processes to enhance the identification and tracking of prospective engineering students.

c) Seek access to post-transfer performance data in order to evaluate overall success of entire Engineering Transfer Program.

Strategy 2: Continually re-evaluate and update curriculum in response to a dynamic educational and occupational environment.

a) Update course outlines to ensure ongoing articulation.

b) Update A.S. degrees to reflect current course offerings.

c) Continue to attend annual ELC meetings in order to anticipate upcoming changes in transfer requirements and share best practices with other Engineering faculty.

d) Consider opportunities to incorporate current societal trends (e.g., sustainability, energy issues, etc.) into curriculum.

Strategy 3: Improve student access to Engineering transfer

a) Plan and seek institutional support for a K-12 Engineering outreach program to promote interest in, and preparation for, Engineering study.

b) Contingent upon availability of data, attempt to analyze streams of prospective Engineering students to identify potential barriers to persistence in the program or other reasons for low appearance of students in ENGG courses.

c) Investigate the establishment of a MESA program at COM to provide support to students from under-represented groups in Science and Engineering.

IV. Other Concluding Remarks
Briefly summarize any additional insight necessary to conclude this program review.