

Comprehensive Program Review Report



Program Review - Engineering

Program Summary

2023-2024

Prepared by: Dillon Allen, Francisco Banuelos, and Larry Owens

What are the strengths of your area?: Our strengths for this program include 89.5% success rate with female students and high success rates for both first generation and non-first generation students (81.6% and 88.6% respectively). The program has been seeing a consistent increase in enrollment, with our FTES/FTEF ratio being 8.88, which shows promise that next year will have even better results. Engineering 110 has a ratio of 15.25, which also sees a 90% success rate.

What improvements are needed?: Although we are seeing a consistent rise in the FTES/FTEF ratio, this is still far below the "industry standard" for all courses of 17.5 target. On top of the ratio, ENGR 002 has seen a dramatic decrease in classroom success, dropping from 70% in 2021-22 to 60% in 2022-2023. The last few years has seen a decline in the success rate in ENGR 002, so an action item is being developed and implemented for the next academic year. On a final note, we would like to see an increase in female students for the engineering program as the 2022-2023 population is sitting at 14%, this could be addressed through other action items in the future.

Describe any external opportunities or challenges.: State legislation, AB 705, AB 1705, and CalGETC are in their initial stages. We need to assess the implications that AB705 has had on Engineering since its implementation in 2019-2020. As for AB 1705 and CalGETC, they have yet to be implemented. However, this will have an impact on all STEM programs and courses.

In meetings with the local chapter of the American Council of Engineering Companies (ACEC), the need for local surveyors, surveying technicians, and civil engineers with surveying experience was clearly expressed. This continues to be an opportunity for the program.

Overall SLO Achievement: All course-level assessments are up to date. Student assessments indicate that students are generally performing as expected, but there is room for improvement.

Changes Based on SLO Achievement: No additional changes based on SLOs are planned at this time.

Overall PLO Achievement: Students who complete the requirements for the Engineering AS degree or who successfully transfer at the junior level are achieving the PLOs. The PLOs for the engineering program are:

1. Students will develop the ability to identify, formulate, and solve engineering problems (e.g. circuits, statics, materials, graphics).
2. Students will develop the ability to design and conduct experiments, as well as to analyze and interpret data.
3. Students will develop the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Changes Based on PLO Achievement: No program changes based on program-level outcomes at this time.

Outcome cycle evaluation: The engineering program is meeting the assessment cycle requirements. The cycle is designed to regularly assess the engineering courses.

Action: 2023-24 ENGR 002 Pass Rates

We notice a decrease in pass rates for ENGR 002 and one of the plans of attack is to spend more time with problem solving workshops to help students gain confidence in their problem-solving abilities.

Leave Blank:

Implementation Timeline: 2023 - 2024

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Identify related course/program outcomes: Course Outcome 1

Person(s) Responsible (Name and Position): Dillon Allen

Rationale (With supporting data): Out of all of the Engineering courses offered at COS, ENGR 002 has a historically low pass rate. Course outcome 1 is the most vital in establishing student success in the course.

Priority: High

Safety Issue: No

External Mandate: No

Safety/Mandate Explanation:

Action: (Completed) Hire a new full-time Engineering instructor (Replacement)

Dr. Larry Owens will not be teaching engineering courses after this academic year. A qualified replacement needs to be hired.

Leave Blank:

Implementation Timeline: 2022 - 2023

Leave Blank:

Leave Blank:

Identify related course/program outcomes:

Person(s) Responsible (Name and Position): Francisco Banuelos, Matt Bourez, Larry Owens

Rationale (With supporting data): The engineering program has grown tremendously since Dr. Owens began teaching at COS in 2000-2001. As Dr. Owens will step down from his teaching duties at the end of this academic year, a qualified engineering professor will need to be hired. The engineering program supports higher-level mathematics and physics at the college because of the requirements of the engineering curriculum. Without an engineering program, mathematics and physics will be adversely affected.

Priority: High

Safety Issue: No

External Mandate: No

Safety/Mandate Explanation:

Update on Action

Updates

Update Year: 2023 - 2024

10/11/2023

Status: Action Completed

The engineering faculty position was approved and a faculty was hired.

Impact on District Objectives/Unit Outcomes (Not Required):

Resources Description

Personnel - Faculty - Hire a replacement faculty member for the engineering program. (Active)

Why is this resource required for this action?: Spring 2023 will be the last semester of teaching for the current engineering professor, Dr. Larry Owens. Besides engineering classes, the engineering program supports upper-level courses in math, physics, and chemistry because of the major preparation courses needed for engineering transfer students. Without a full-time engineering professor, the engineering program will suffer and lead to declines in other advanced STEM courses. The engineering program has grown tremendously since Dr. Owens started in Fall 2000. We want to build on that success and continue the growth of our engineering program by hiring a qualified and motivated professor to work with our diverse student population.

Notes (optional):

Cost of Request (Nothing will be funded over the amount listed.): 150000

Link Actions to District Objectives

Program Review - Engineering

District Objectives: 2018-2021
District Objective 1.1 - The District will increase FTES by 1.75% over the three years
District Objective 2.1 - Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years
District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years
District Objectives: 2021-2025
District Objective 1.1 - The District will increase FTES 2% from 2021 to 2025.
District Objective 2.1 - Increase the number of students who earn an associate degree or certificate (CTE and non-CTE) by 5% from 2021-2025.
District Objective 2.2 - Increase the number of students who are transfer-ready by 15% and students who transfer to four-year institutions by 10% from 2021-2025.
District Objective 3.1 - Reduce equity gaps in course success rates across all departments by 40% from 2021-2025.

Action: (In Progress) Expand storage and work areas for engineering and physics equipment and projects.

Provide adequate safe storage for physics and engineering laboratory and class equipment and supplies. This may include the remodeling of JM 211, JM 208. and JM 209.

Leave Blank:

Implementation Timeline: 2022 - 2023

Leave Blank:

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Identify related course/program outcomes: Equipment and supplies affect all outcomes in physics and engineering. We need to be able to store these items in a way that allows faculty to access them in a safe and organized manner.

Person(s) Responsible (Name and Position): Larry Owens, Quinn MacPherson, Marc Royster, Byron Woods, Francisco Banuelos

Rationale (With supporting data): Currently there is not adequate safe storage for all the equipment and supplies used in and in support of engineering and physics courses. Some equipment, such as the air tracks, have never had a safe and appropriate location (currently awkward and heavy air tracks are stored on top of the cabinets in the laboratory). Some equipment and supplies have been added since the construction of the John Muir building. For example, 3D printing was not common equipment when the building was built, but now they are part of laboratory experiences in several classes. Other equipment and supplies have been added because the number of sections and the number of students in sections has increased.

Priority: High

Safety Issue: Yes

External Mandate: No

Safety/Mandate Explanation: The current methods of storage have the potential of causing damage or injury. For example, the air tracks are not easy to lift down from their storage location on top of the cabinets and must be secured once in place. The crowded storage conditions in the storage/workroom (JM 209) create the potential for unsafe conditions. Having designated storage for all the equipment and supplies we use is an important safety issue.

Update on Action
<p><i>Updates</i></p> <p>Update Year: 2023 - 2024 10/11/2023</p> <p>Status: Continue Action Next Year</p> <p>The resource was approved and planned to be completed by fall 2023. However, the project has been delayed given the capacity of facilities to complete the project.</p> <p>Impact on District Objectives/Unit Outcomes (Not Required):</p>

Resources Description

Program Review - Engineering

Facilities - Re-organization and expansion of storage for engineering and physics equipment and supplies. This has been discussed with Facilities dean, Byron Woods. It will likely involved a remodel of workroom and current computer lab area. (Active)

Why is this resource required for this action?: We are out of storage and work space for engineering and physics. We had a net loss of storage space when we moved from the Sequoia building to the John Muir building in 2007. We have eliminated a lot of older equipment, but we have also acquired new equipment like 3D printers, a laser cutter, telescopes, and a torsion tester. These are large items that require proper storage or work space. Just leaving equipment out is bad for the equipment (dust, unsupervised use, etc.) and can present a safety hazard when working around the equipment of when moving it. Friday Night Lab (FNL) also uses this lab area and workroom to provide hands-on experiences for students. FNL has also acquired equipment that needs storage. Space for students to store work-in-progress is also needed.

Notes (optional):

Cost of Request (Nothing will be funded over the amount listed.): 50000

Link Actions to District Objectives

District Objectives: 2018-2021

District Objective 1.1 - The District will increase FTES by 1.75% over the three years

District Objective 2.1 - Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years

District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years

District Objectives: 2021-2025

District Objective 1.1 - The District will increase FTES 2% from 2021 to 2025.

District Objective 2.1 - Increase the number of students who earn an associate degree or certificate (CTE and non-CTE) by 5% from 2021-2025.

District Objective 2.2 - Increase the number of students who are transfer-ready by 15% and students who transfer to four-year institutions by 10% from 2021-2025.

District Objective 3.1 - Reduce equity gaps in course success rates across all departments by 40% from 2021-2025.

Action: (Completed) Develop on-going Friday Night Lab (FNL) processes

Develop methods to institutionalize FNL and compensate faculty and staff.

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Implementation Timeline: 2022 - 2023

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Identify related course/program outcomes:

Person(s) Responsible (Name and Position): Francisco Banuelos, Larry Owens

Rationale (With supporting data): Most Friday nights during the school year there are 30 -50 students along with faculty, staff and community members participating in FNL activities. The activities vary including, faculty facilitated student research, hands on demonstrations and skills development, programing, computer based problems, electronic projects, design for and utilization of 3D printers and similar activities. There are also students working problems on hallway whiteboards from classes or about topics that interest them. It is a bit of a maker-space, research support, basic skills development (soldering, circuits etc.), and similar time. FNL provides a place for students who often do not become involved in traditional COS activities to learn practical academic skills as well as soft skills. In 2014 several COS faculty & staff began offering Friday night activities as part of a SURGE grant. It quickly became obvious that there was significant student interest. Activities expanded, continuing the focus on science, math and engineering topics as well as a focus on students who were interested in these areas but often do not respond to traditional programs or outreach. Gradually systems of communication have developed and efforts are being made to develop a semi-standardized calendar. In 2021 COS Foundation received a large donation which endowed FNL with about

Program Review - Engineering

\$30,000/year for student grants as well as supplies for the program. For FNL to continue, some sort of compensation needs to be developed for staff and faculty. Currently, FNL is organized and administered with volunteer leadership (faculty and staff). Compensation could be release time or some other method.

Priority: High

Safety Issue: No

External Mandate: No

Safety/Mandate Explanation:

Update on Action

Updates

Update Year: 2023 - 2024

10/11/2023

Status: Action Completed

FNL has been incorporated under the MESA program, which has been fully funded by the State Chancellor's Office. Funding that supports a full-time Director, a 50% faculty Liaison, stipends and hourly pay for FNL faculty and staff is included in the budget.

Impact on District Objectives/Unit Outcomes (Not Required):

Resources Description

Personnel - Faculty - Release time for one or more faculty members is required to run Friday Night Lab. Some manner of compensation is also needed for classified staff who help run Friday Night Lab. (Active)

Why is this resource required for this action?: Friday Night Lab (FNL) provides hands-on experiences for STEM students on a weekly basis. FNL has helped many STEM students by providing meaningful experiences in their chosen majors. These experiences help them to get internships, university admissions, and other opportunities to further their educations and careers. FNL has been operating on a primarily volunteer basis with some funding from the COS Foundation. FNL operated on this shoestring budget for about 7 years. However, beginning this year (2022-2023), FNL is funded from an endowment created from a generous donation to the Foundation. The annual budget has tripled this year and will continue to grow over the next few years depending on the annual returns on the endowment. This increased budget requires increased planning, oversight, and implementation than in previous years. It is reasonable for the District to help fund and institutionalize this successful program.

Funding for this position could also include grant-writing responsibilities to increase opportunities for students and to help offset some District funding by including release time for personnel associated with Friday Night Lab in grant proposals. Grant proposals would be written specifically to benefit students, faculty, and staff in STEM.

Notes (optional):

Cost of Request (Nothing will be funded over the amount listed.): 200000

Link Actions to District Objectives

District Objectives: 2018-2021

District Objective 1.1 - The District will increase FTES by 1.75% over the three years

District Objective 2.1 - Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years

District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years

District Objectives: 2021-2025

District Objective 1.1 - The District will increase FTES 2% from 2021 to 2025.

District Objective 2.1 - Increase the number of students who earn an associate degree or certificate (CTE and non-CTE) by 5% from 2021-2025.

District Objective 2.2 - Increase the number of students who are transfer-ready by 15% and students who transfer to four-year institutions by 10% from 2021-2025.

District Objective 3.1 - Reduce equity gaps in course success rates across all departments by 40% from 2021-2025.

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Action: Support a full and robust MESA program

Follow state guidelines to develop a full and robust MESA program.

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Implementation Timeline: 2022 - 2023

Leave Blank:

Leave Blank:

Identify related course/program outcomes:

Person(s) Responsible (Name and Position): Francisco Banuelos

Rationale (With supporting data): The current COS MESA program supports many STEM majors including engineering majors. Although the current program is certainly good, the college has a unique opportunity to develop a full and robust MESA program. Taking advantage of this opportunity will allow COS to strengthen the current MESA program as well as qualify for state funding related to the MESA program. State guidelines related to personnel require a full-time MESA director (who has no other duties), a clerical position, a faculty sponsor, appropriate staffing (tutors, facilitators, coordinator) to assist with Academic Excellence Workshops (AEWs), and a designated MESA counselor. The college already has a position very similar to the MESA director position (this position is required as part of the district match), a MESA tutoring/AEW program that would just need some changes, and a STEM designated counselor. MESA state funds can be used to support a clerical position. Many years ago, release time (0.3 FTE) was given to a faculty member to serve as the faculty sponsor. Another major component of the state guidelines is a Student Center in or near the science, math and engineering departments. The current MESA room in John Muir building would meet this requirement.

COS is very close to meeting the requirements for a state funded MESA program. Fully meeting these requirements would strength support for our math, science and engineering students.

Priority: High

Safety Issue: No

External Mandate: Yes

Safety/Mandate Explanation: The California State Legislature passed a budget that included a fully-funded MESA program for every community college.

Link Actions to District Objectives

District Objectives: 2018-2021
District Objective 1.1 - The District will increase FTES by 1.75% over the three years
District Objective 2.1 - Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years
District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years
District Objectives: 2021-2025
District Objective 1.1 - The District will increase FTES 2% from 2021 to 2025.
District Objective 2.1 - Increase the number of students who earn an associate degree or certificate (CTE and non-CTE) by 5% from 2021-2025.
District Objective 2.2 - Increase the number of students who are transfer-ready by 15% and students who transfer to four-year institutions by 10% from 2021-2025.
District Objective 2.3 - Increase the percentage of students who complete both transfer-level Quantitative Reasoning and English by 10 percentage points by the end of their first year from 2021-2025.
District Objective 3.1 - Reduce equity gaps in course success rates across all departments by 40% from 2021-2025.
District Objective 3.2 - Increase the course success rate by 10% for each disproportionately impacted student group in their transfer level Quantitative Reasoning and English courses by the end of their first year from 2021-2025.

Action: Expand opportunities and training for students and meet local

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employment needs by exploring possible surveying course

Develop a surveying course and investigate the possibility of a surveying certificate program.

Leave Blank:

Implementation Timeline: 2019 - 2020, 2020 - 2021, 2021 - 2022, 2022 - 2023

Leave Blank:

Leave Blank:

Identify related course/program outcomes: Adding a surveying course to the engineering curriculum will allow engineering majors the opportunity to investigate another area of engineering and to prepare themselves more fully for transfer to the university level (surveying is a required course for civil engineering majors). The course would support the following program-level outcomes:

Engineering Problems: Students will develop the ability to identify, formulate, and solve engineering problems (e.g. circuits, statics, materials, graphics).

Experiments and data analysis: Students will develop the ability to design and conduct experiments, as well as to analyze and interpret data.

Engineering tools and techniques: Students will develop the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The course would be designed to apply to majors other than engineering - such as agriculture, architecture, and construction. The local engineering and surveying companies are in need of entry-level surveying technicians. This course and the possible surveying certificate would create a pipeline to support the local economy and the following District Objectives:

District Objective 1.1 The District will increase FTES by 1.75% over the three years

District Objective 2.1 Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years

District Objective 2.2 Increase the number of students who transfer to a four-year institution by 10 percent over three years

Person(s) Responsible (Name and Position): Larry Owens, Engineering Professor

Rationale (With supporting data): In meetings with the local chapter of the American Council of Engineering Companies (ACEC), the need for local surveyors, surveying technicians, and civil engineers with surveying experience was clearly expressed. To help meet this need, I am developing a surveying course and looking into the possibility of offering a certificate in surveying. The college has approved an Institutional Improvement Project (IIP) with 3 hours of release time in spring 2020 to research and develop the course and, if deemed feasible, the certificate. In addition to engineering majors, surveying should be useful for agriculture, architecture, and construction majors.

Priority: High

Safety Issue: No

External Mandate: No

Safety/Mandate Explanation:

Update on Action

Updates

Update Year: 2023 - 2024

10/11/2023

Status: Continue Action Next Year

The Engineering program is going through a transition. We hired a new faculty and the MESA program has been fully established, giving us a great opportunity to achieve this action. We will set it to continue into the next year, in hopes of developing a surveying course.

Impact on District Objectives/Unit Outcomes (Not Required):

Update Year: 2022 - 2023

09/14/2022

Status: Continue Action Next Year

COVID affects including safety and increased employer load prevented this action from moving forward last year. The need is still there.

Impact on District Objectives/Unit Outcomes (Not Required):

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Link Actions to District Objectives

District Objectives: 2018-2021
District Objective 1.1 - The District will increase FTES by 1.75% over the three years
District Objective 2.1 - Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years
District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years
District Objectives: 2021-2025
District Objective 2.1 - Increase the number of students who earn an associate degree or certificate (CTE and non-CTE) by 5% from 2021-2025.
District Objective 2.2 - Increase the number of students who are transfer-ready by 15% and students who transfer to four-year institutions by 10% from 2021-2025.
District Objective 2.4 - Increase the percentage of CTE students who achieve their employment objectives by five percentage points (job closely related to field of study and attainment of a livable wage) and the number of CTE students who successfully complete 9+ CTE units in a single year by 10% from 2021-2025.

Action: (Completed) Improve on-going fiscal support for engineering laboratory experiences.

Increase the engineering budget for consumable supplies used in engineering labs. A significant amount of this is to support the use of the new (over the last two years) 3-D printers. Filament is required to run these printers. 3-D printers are now a common tool in colleges, universities and industry.

Leave Blank: New Action

Implementation Timeline: 2019 - 2020, 2020 - 2021, 2021 - 2022, 2022 - 2023

Leave Blank:

Leave Blank:

Identify related course/program outcomes: Consumable supplies for use in the engineering courses and associated labs supports the following Engineering program-level outcomes.

2. Students will develop the ability to design and conduct experiments, as well as to analyze and interpret data.

3. Students will develop the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Person(s) Responsible (Name and Position): Larry Owens (Engineering/Physics Professor)

Rationale (With supporting data): Although many divisions and departments received a permanent increase in supplies in fall 2018 engineering did not. It was assumed that engineering had other resources. This is not true. Although engineering does sometimes have access to grant money this access is not permanent and should not be considered part of the engineering base budget. Many of the supplies used in the engineering labs are consumables - solder, electronic components, and filament for 3D printers. The engineering budget has actually decreased from levels of several years ago. The supply budget needs to be augmented to make up for those losses and cover the increase in prices for supplies as well as for supplies that are new needs such as 3D printer filament (approximately \$30-\$40/kg).

Priority: High

Safety Issue: No

External Mandate: No

Safety/Mandate Explanation:

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Update on Action

Updates

Update Year: 2023 - 2024

10/11/2023

Status: Action Completed

Received a budget augmentation.

Impact on District Objectives/Unit Outcomes (Not Required):

Update Year: 2022 - 2023

09/14/2022

Status: Continue Action Next Year

We did not receive a budget augmentation for this last year. The need has increased since the cost of supplies, including filament for the 3-D printers has increased. We will be asking for a \$500 budget augmentation this coming year.

Impact on District Objectives/Unit Outcomes (Not Required):

Resources Description

Adjustment to Base Budget - Increase the engineering budget by \$500 for consumable supplies used in engineering labs. A significant amount of this is to support the use of the new (over the last two years) 3-D printers. Filament is required to run these printers. 3-D printers are now a common tool in colleges, universities and industry. (Active)

Why is this resource required for this action?: Engineering students need to experience and work with equipment they will see and use when the transfer as well as when they work in industry.

Notes (optional): Although many divisions and departments received a permanent increase in supplies in fall 2018 engineering did not. It was assumed that engineering had other resources. This is not true. Although engineering does sometimes have access to grant money this access is not permanent and should not be considered part of the engineering base budget. Many of the supplies used in the engineering labs are consumables - solder, electronic components, and filament for 3D printers. The engineering budget has actually decreased from levels of several years ago. The supply budget needs to be augmented to make up for those losses and cover the increase in prices for supplies as well as for supplies that are new needs such as 3D printer filament (approximately \$30-\$40/kg).

Cost of Request (Nothing will be funded over the amount listed.): 500

Adjustment to Base Budget - Engineering lab supplies especially filament for 3-D printers (Active)

Why is this resource required for this action?: We need to have supplies, including filament, to provide effective learning experience for students.

Notes (optional):

Cost of Request (Nothing will be funded over the amount listed.): 500

Link Actions to District Objectives

District Objectives: 2018-2021

District Objective 1.1 - The District will increase FTES by 1.75% over the three years

District Objective 2.1 - Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years

District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years

District Objectives: 2015-2018

District Objectives - 2.1 - Increase the number of students who are transfer-prepared annually.

District Objectives - 2.2 - Increase the number of students who earn an associate degree or certificate annually.

District Objectives - 3.1 - Reduce the achievement gap of disproportionately impacted student groups annually, as identified in the Student Equity Plan.

District Objectives: 2021-2025

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District Objective 2.2 - Increase the number of students who are transfer-ready by 15% and students who transfer to four-year institutions by 10% from 2021-2025.

District Objective 3.1 - Reduce equity gaps in course success rates across all departments by 40% from 2021-2025.