

Engineering Technology (ENGT)



2020

ANNUAL REVIEW OF PROGRAM DATA



UNIVERSITY of HAWAII®
MAUI COLLEGE

1. Program or Unit Description

Program Mission

The mission of the ENGT program is to prepare graduates to be productive technologists with a broad array of skills in a variety of areas such as telescope operations, high performance computing for scientific and engineering applications, energy production and distribution, and system administration in a variety of industries. [

What is the target student or service population?

The program targets high school students interested in electronics, programming, technology, and their applications; graduates from an Associate in Science in Electronic Technology or similar willing to pursue a baccalaureate degree; and returning students.

2. Analysis of the Program/Unit

Although a small program, the ENGT program has shown to fulfill its main objective: provide the high-tech local companies with a skilled and talented pool of bachelor's degree students, indicated by the high employment rate of 90% (87% on Maui). Table 1 below summarized employment data, from 2012 to 2020: it shows the name of the companies who hired an ENGT graduate, the graduation year, and the number of graduates in parenthesis. The overall indicator is Cautionary

Table 1. Employment data, 2012-2020

2012 (3)	2013 (3)	2014 (4)	2015 (4)	2016 (4)
PDS, Maui	WZ Engineering, Maui	PDS, Maui	(UCLA, Grad School)	Akimeka, Maui
PDS, Maui	Ardent, Maui	PDC, Maui	Monsanto	PDS, Maui
Boeing, Maui	General Assembly, SF	Sheraton, Maui	CSRA Inc., Maui	Boeing, Maui
		Enterprise, Maui	PDS, Maui	HNU Photonics
2017 (1)	2018 (4)	2019 (3)	2020 (4)	
HNU Photonics	Hawaiian Dredging Construction	PDS, Maui	IT UHMC	
	Boeing, Maui	(Unknown)	Boeing, Maui	
	Castaway Construction& Restoration	(Unknown)	HNU Photonics	
	HNU Photonics, Maui		PDC, Maui	

Demand Health

The demand health, which states that the program is cautionary, is based on the number of new and replacement positions in the county prorated (#2), and the number of BAS ENGT graduates (#20a). We believe that the demand health does not reflect the reality.

2020 UH Maui College ARPD
Program: ENGT

#	Demand Indicators	2017 - 18	2018 - 19	2019 - 20	Demand Health
1.	New & Replacement Positions (State)	72	61	62	Cautionary Insufficient Data County Level
2.*	New & Replacement Positions (County Prorated)	2	2	2	
3.	Number of Majors	13	12	9	
3a.	Number of Majors Native Hawaiian	2	1	1	
3b.	Fall Full-Time	77%	55%	33%	
3c.	Fall Part-Time	23%	45%	67%	
3d.	Fall Part-Time who are Full-Time in System	0%	0%	0%	
3e.	Spring Full-Time	67%	50%	33%	
3f.	Spring Part-Time	33%	50%	67%	
3g.	Spring Part-Time who are Full-Time in System	0%	0%	0%	
4.	SSH Program Majors in Program Classes	239	144	109	
5.	SSH Non-Majors in Program Classes	81	88	57	
6.	SSH in All Program Classes	320	232	166	
7.	FTE Enrollment in Program Classes	11	8	6	
8.	Total Number of Classes Taught	14	12	12	

The CIP code chosen for the ENGT program (15.9999) restricts positions to engineering and electro-mechanical technicians. However, ENGT graduates are also hired into positions that refer to different CIP codes. BAS ENGT graduates have found high-paying rewarding jobs on Maui as electro-optical technologists, electronics design engineers, software developers, junior engineers, system administrators, and project engineers. If we were to include all possible job positions, the ratio of new and replacement positions in the county prorated to the number of BAS ENGT graduates would be higher.

Table 2 below indicates the number of graduates who were hired annually as compared to the official number of available positions for the last three years.

Table 2. Number of job positions

Graduation year	# graduates	# hired	# positions
Spring 2018	4	4	2
Spring 2019*	3	1	2
Spring 2020	4	3	2

* 2 students did not provide any feed-back after graduation

The table shows that the number of jobs available is higher than the official number of positions available.

Efficiency Health

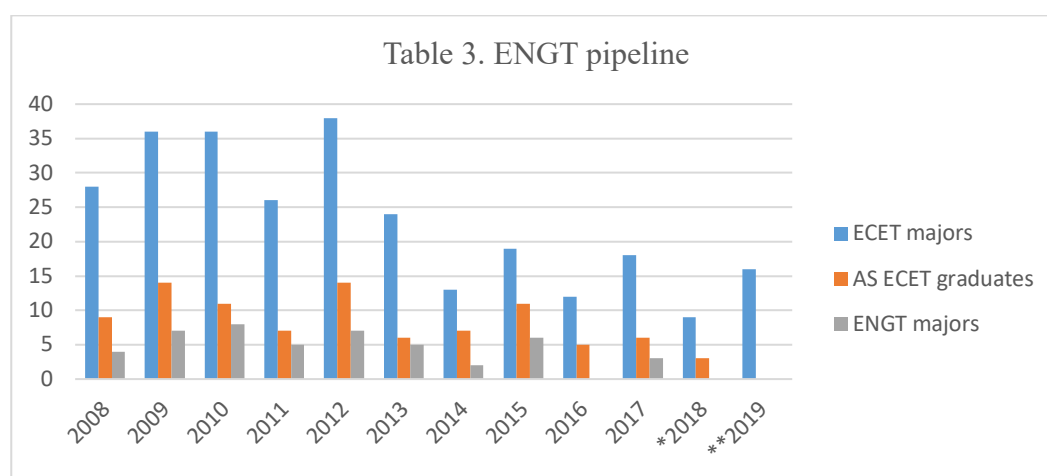
The efficiency health, which states that the program is unhealthy, is based on the fill class rate (#10), and the majors to FTE BOR Appointed Faculty (#12).

#	Efficiency Indicators	2017 - 18	2018 - 19	2019 - 20	Efficiency Health
9.	Average Class Size	7	6	4	Unhealthy
10.*	Fill Rate	51.1%	40.8%	28.7%	
11.	FTE BOR Appointed Faculty	2	2	2	
12.*	Majors to FTE BOR Appointed Faculty	6	6	5	
13.	Majors to Analytic FTE Faculty	6	6	5	
13a.	Analytic FTE Faculty	2	2	2	
14.	Overall Program Expenditures	\$180,086	\$154,190	\$168,797	
14a.	General Funded Budget Allocation	\$180,086	\$154,190	\$168,797	
14b.	Special/Federal Budget Allocation	0	0	0	
14c.	Tuition and Fees	0	0	0	
15.	Cost per SSH				
16.	Number of Low-Enrolled (<10) Classes	13	10	11	

Unless the number of majors increases substantially, this indicator will remain unhealthy or cautionary. The UHMC ENGT faculty is working diligently to find ways to expand its program and recruit students from outside the island of Maui.

Current recruitment:

Historically, the ENGT program recruits among UHMC ECET majors (81% of ENGT majors are former ECET majors). The chart below links the number of students who enroll in the ENGT program (ENGT majors) to the number of AS ECET graduates, and the number of ECET majors, for successive cohorts of ECET students, from 2008 to 2019. A cohort regroups students enrolling in ETRO 105 (the first ETRO course of the ECET program and prerequisite to all ETRO courses) on a given year. As an example, in Fall 2017, a cohort of 18 students enrolled in the ECET program. Over the next years, a total of 6 students from this cohort graduated with the AS ECET; 3 enrolled in the ENGT program.



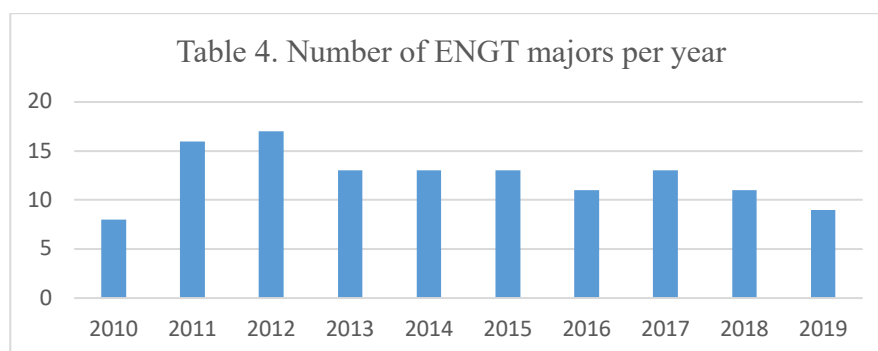
*the ENGT program was not offered to this cohort when students graduated in 2020.

** students haven't graduated yet with the AS ECET

As Table 3 above shows, the number of ECET majors has declined over the years, mirroring UHMC general decline in enrollment number. Data collected since 2008 show that, on average,

51% of AS ECET graduates (18% of ECET majors) pursue the BAS ENGT. If the enrollment numbers in the ECET program stay the same as the last three years', we can expect that, on average, 3-4 AS ECET graduates will enroll in the ENGT program annually, which is not sustainable. The demand indicator reflects this weakness of the ENGT program.

The ENGT program is recruiting students among the ECET pool of students (81%) and accepts students from other programs and/or institutions (9%). Table 4 below shows the total number of students (juniors and seniors, part-time and full-time) enrolled in the ENGT program each year from 2010 to 2019.



Expanding the ENGT program:

As Table 4 shows, the number of ENGT majors has been dropping slowly and steadily. Faced with this small number and the limited pool of ECET majors, it seemed reasonable to outreach to other islands offering an associate degree similar to UHMC's for recruitment purposes. UHMC is now expanding the BAS ENGT to the island of Hawai'i in partnership with HawCC. The Memorandum of Agreement signed between UHMC, HawCC, and UH Hilo in Spring 2019 allows HawCC students that complete the Associate in Applied Science (AAS) in Electronics Technology (ET) to pursue and graduate with the UHMC BAS ENGT while staying on Hawai'i. UHMC will offer ETRO courses in-person for Maui students and synchronously online via a teleconferencing platform for Hawai'i students. This agreement will be implemented starting in Fall 2021, following August 2020 WSCUC's approval to offer the BAS ENGT in distance education modality.

KauaiCC offers an Associate in Science (AS) in Electronics Technology (ET). Our next plan is to expand the BAS ENGT to KauaiCC and establish a memorandum of agreement with KauaiCC. The college could also market the program outside the Hawaiian Islands since the BAS ENGT program will be offered in distance education modality starting Fall 2021.

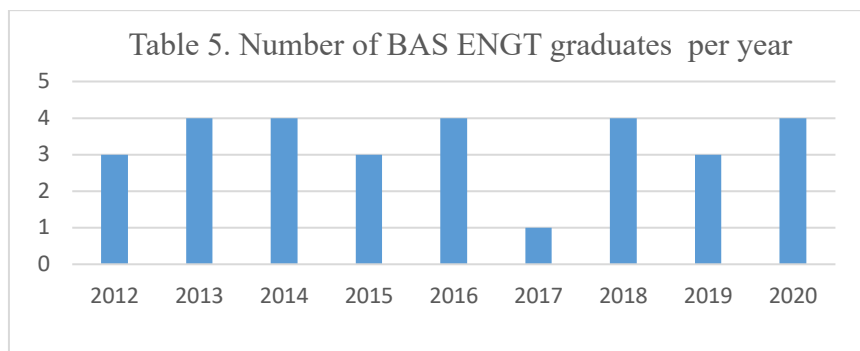
Effectiveness Health

This indicator is healthy.

2020 UH Maui College ARPD
Program: ENGT

#	Effectiveness Indicators	2017 - 18	2018 - 19	2019 - 20	Effectiveness Health
17.	Successful Completion (Equivalent C or Higher)	84%	93%	84%	Healthy
18.	Withdrawals (Grade = W)	8	4	4	
19.*	Persistence Fall to Spring	92%	91%	88%	
19a.	Persistence Fall to Fall	80%	75%	60%	
20.*	Unduplicated Degrees/Certificates Awarded	3	4	4	
20a.	Degrees Awarded	3	4	4	
20b.	Certificates of Achievement Awarded	0	0	0	
20c.	Advanced Professional Certificates Awarded	0	0	0	
20d.	Other Certificates Awarded	0	0	0	
21.	External Licensing Exams Passed ¹				
22.	Transfers to UH 4-yr	6	4	3	
22a.	Transfers with credential from program	5	3	3	
22b.	Transfers without credential from program	1	1	0	

Table 5 below shows that the number of BAS ENGT graduates has been consistent since the start of the ENGT program. We anticipate 3 graduates in Spring 2021.



As a reminder, 90% of ENGT graduates find a well-paying job in the high technology sector, 87% on Maui. Most Companies will only hire graduates with a bachelor's degree.

Perkins Indicators

#	Perkins Indicators	Goal	Actual	Met	
29.	1P1 Technical Skills Attainment	94.75	100	Met	
30.	2P1 Completion	61	50	Not Met	
31.	3P1 Student Retention or Transfer	86	100	Met	
32.	4P1 Student Placement	66.75	40	Not Met	
33.	5P1 Nontraditional Participation	23.75	7.69	Not Met	
34.	5P2 Nontraditional Completion	23.25	0	Not Met	

2P1: The ENGT program has steadily graduated 3-4 ENGT majors per year, with an average graduation rate of 56% from 2012 to 2020.

4P1: 90% (87% on Maui) of ENGT BAS graduate students (from 2012 to 2020) have found a high-paying job after graduation. Each year, local companies hire ENGT graduates. Numbers of graduates and number of hired graduates over the past three years are given in table 2, as compared to the number of county positions (prorated). As shown in Table 2, it is clear that there are more jobs offerings on Maui than indicated by the official number of positions available in the ARPD.

5P1 and 5P2: In general, STEM is underrepresented. Efforts to drive underrepresented students into the program has not shown to be successful

3. Program Student Learning Outcomes or Unit/Service Outcomes

a) List of the Program Student Learning Outcomes or Unit/Service Outcomes

BAS ENGT PLO's in alignment with the Accreditation Board for Engineering and Technology (ABET) Student Outcomes:

BAS in ENGT Program Learning Outcomes	2017-2018 ABET Student Outcomes*
1. Analyze, design, and implement electro-optic systems, control systems, instrumentation systems, communication systems, computer systems, or power systems	An ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives
2. Apply project management techniques to electrical/electronic(s) and computer systems	An ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities
3. Utilize integral and differential calculus, or other appropriate mathematics above the level of algebra and trigonometry to solve technical problems	An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies
4. Demonstrate critical engineering technology skills and experiences such as: making existing technology operate, creating/selecting new technology, troubleshooting, calibrating, characterizing, and optimizing	An ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes
5. Demonstrate engineer's way of thinking, analyzing technology as systems	An ability to identify, analyze, and solve broadly-defined engineering technology problems
6. Demonstrate engineer professional skills such as communication and managing projects	An ability to function effectively as a member or leader on a technical team

7. Demonstrate proficiency in the general education college core requirements: creativity, critical thinking, oral and written communication, information retrieval, quantitative reasoning	An ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature
8. Demonstrate a recognition of the need for, and an ability to engage in lifelong learning	A knowledge of the impact of engineering technology solutions in a societal and global context
9. Demonstrate an ability to understand professional, ethical and social responsibilities	An understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity
10. Demonstrate a respect for diversity and a knowledge of contemporary professional, societal and global issues	An understanding of the need for and an ability to engage in self-directed continuing professional development
11. Commit to quality, timeliness, and continuous improvement	A commitment to quality, timeliness, and continuous improvement

*Source : <http://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-technology-programs-2017-2018/#studentoutcomes>

b) Program or Unit/Service Outcomes that have been assessed in the year of this Annual Review.

In Fall 2019:

PLO3 (ETRO 305)

PLO5 (ETRO 305)

In Spring 2020:

PLO1 (ETRO 498)

PLO 11 (ETRO 498)

c) Assessment Results.

Desired Outcome Performance Criteria for ETRO 305 and ETRO 498:

A - B Exceeds	C Meets	D Needs Improvement	F Insufficient Progress
80% ≥	70% ≥	60% ≥	59%

Assessment in ETRO 305:

The PLO's were too broad to efficiently assess the students. The instructor used the more detailed sub standards from the CASLO grid. The assessment is based on Quantitative Reasoning, sub-standards 2.1 and 2.2, and Critical Thinking, sub-standards 5.5 and 5.6.

Standard 2 - Quantitative Reasoning

Synthesize and articulate information using appropriate mathematical methods to solve problems of quantitative reasoning accurately and appropriately.

Outcome 2.1: Apply numeric, graphic, and symbolic skills and other forms of quantitative reasoning accurately and appropriately.

Outcome 2.2: Demonstrate mastery of mathematical concepts, skills, and applications, using technology when appropriate.

Standard 5 - Critical Thinking

Apply critical thinking skills to effectively address the challenges and solve problems.

Outcome 5.5: Evaluate a problem, distinguishing between relevant and irrelevant facts, opinions, assumptions, issues, values, and biases through the use of appropriate evidence.

Outcome 5.6: Apply problem-solving techniques and skills, including the rules of logic and logical sequence.

Assessment tools used:

1. Homework: SLO 2.1, 2.2
2. Class Activities/Project: SLO 5.5, 5.6
3. Exam: SLO 2.1, 2.2, 5.5, 5.6

Course Assessment Results

Standard 2 and 5

SLO Assessed:	2.1	2.2	5.5	5.6
Assessment Results:	91.38	86.92	89.64	87.86
Outcome	A	A	A	A

Assessment in ETRO 498

The PLO's were too broad to efficiently assess the students. The instructor used the more detailed sub standards from the CASLO grid. The assessment is based on Written Communication, sub-standards 1.7 and 1.8, Oral Communication, sub-standard 4.5, Critical thinking, sub-standards 5.5, 5.6, and 5.9, and Creativity, sub-standards 6.5 and 6.6.

Standard 1 - Written Communication

Write effectively to convey ideas that meet the needs of specific audiences and purposes.

Outcome 1.7: Demonstrate a mastery of the conventions of writing, including grammar, spelling, and mechanics.

Outcome 1.8: Demonstrate proficiency in revision and editing.

Standard 4 - Oral Communication

Practice ethical and responsible oral communications appropriately to a variety of audiences and purposes.

Outcome 4.5: Summarize, analyze, and evaluate oral communications and ask coherent questions as needed.

Standard 5 - Critical Thinking

Apply critical thinking skills to effectively address the challenges and solve problems.

Outcome 5.5: Evaluate a problem, distinguishing between relevant and irrelevant facts, opinions, assumptions, issues, values, and biases through the use of appropriate evidence.

Outcome 5.6: Apply problem-solving techniques and skills, including the rules of logic and logical sequence.

Outcome 5.9: Reflect upon and evaluate their thought processes, value system, and world views in comparison to those of others.

Standard 6- Creativity

Able to express originality through a variety of forms.

Outcome 6.5: Demonstrate the ability to trust and follow one's instincts in the absence of external direction

Outcome 6.6: Build upon or adapt the ideas of others to create novel expressions or new solutions.

Assessment tools used:

1. Progress/Final Reports: SLO 1.7, 1.8
2. Presentation: SLO 4.5
3. Project Proposal: SLO 5.5, 5.6, 5.9
4. Project Completion: SLO 6.5, 6.6

Course Assessment Results

Standard 1, 4, 5, and 6

SLO's Assessed:	1.7	1.8	4.5	5.5	5.6	5.9	6.5	6.6
Assessment Results (%)	97.69	97.69	97.92	97.00	97.00	97.00	100.00	100.00
Outcome	A	A	A	A	A	A	A	A

Changes that have been made as a result of the assessment results.

Based on the assessments of student learning outcomes, we do not see a significant lack of participation, nor the need to make changes.

4. Action Plan

Based on findings in parts 1-3, the ENGT program is strong when it comes to graduation rates (56%, with 41% in two years) and consistent job-placement (90% in high tech companies): The broad curriculum allows graduates to apply for or a variety of job positions, where their technical skills (hardware and software) are sought. Remote working is reshaping our world: we anticipate new opportunities for ENGT majors who can be competitive at the state and national scales.

The small number of ENGT majors on the other hand, and subsequent low-enrolled classes, makes for its weakness.

Therefore, we believe that we need to focus on recruitment strategies among:

- High school students on Maui to increase the pool of ECET students
- UHMC AS ECET students
- ET programs on Hawaii` and Kauai
- Novel pathway to the ENGT program
- Scholarships

1. Recruiting High School students on Maui:

UHMC has partnered with Hawai'i P-20 Partnerships for Education: a recorded video of the ECET and ENGT programs was aired during the UH Virtual College Program Fair in August 2020. This video should be sent to high schools to promote the ECET and ENGT programs.

2. Recruiting UHMC ECET majors:

We believe that extra-curricular activities can entice ECET students into wanting to learn more and therefore pursue the ENGT program after AS ECET graduation:

- In Spring 2020, we offered ECET majors the opportunity to participate and compete in the Autonomous Vehicle Technology (AVT) project as part of their ETRO 293v required class. The project was such a success that UH Manoa has now joined the team of Maui ECET students (<https://www.hawaiiavtech.com/about-us> and <https://mauinow.com/2020/09/23/uh-maui-students-successfully-compete-in-hack-a-thon-autonomous-vehicle-tech-race/>).

This project will be offered in Spring 2021 to a new cohort of ECET students.

- Each year, some ECET majors join the team of ENGT majors and have a chance to participate in their capstone project. This year 2020-2021, 2 ECET students are participating in “The 2021 Moon to Mars Ice & Prospecting Challenge”.
- The ECET/ENGT program continues to reach out to the community where individuals are eager to be involved in new projects with Maui students.

3. Recruiting among ET programs on Hawaii` and Kauai:

Within the UH system, ENGT faculty will reach out to HawCC and KauaiCC counselors, instructors, and students. The college could also market the program outside the Hawaiian Islands since the BAS ENGT program will be offered in distance education modality starting Fall 2021.

4. Novel alternative pathway to the ENGT program:

Provide an alternative pathway for four-year students in other engineering fields (e.g., electrical, civil, mechanics, and computer) who do not complete mainland or other UH programs. For example, another UH BS Engineering program has a 40% attrition rate: UHMC could offer these students who drop out of their BS engineering program an alternative pathway to a 4-year degree with completion of the ENGT program. UHMC would schedule a summer bridge program to catch up on labs in electronics that could be missing.

5. Scholarship opportunities:

Scholarships are known to be an incentive for retention and graduation. A National Science Foundation S-STEM scholarship up to \$8,000 a year per student is available for talented, low-income with demonstrated financial need ECET, ENGT, and NSCI majors. Currently one ECET student and one ENGT student are benefitting from this scholarship.

UHMC is also in the third phase of a \$2.6 million scholarship grant that, if approved, will benefit students on an engineering pathway: Maui's ECET, ENGT, and NSCI majors with a concentration in engineering as well as Hawai'i's ET, ENGT and NSCI majors.

Recruitment numbers for Fall 2021 as of October 2020: 8 to 12

- A recent survey dated September 2020 was sent to ECET majors planning to graduate in Spring 2021: 8 students responded and 6 will enroll in the ENGT program in Fall 2021, 2 are unsure.
- 2 HawCC students will enroll in the ENGT program in Fall 2021.
- 2 Kauai students are interested in the program

This number is consistent with the enrollment projections given in the table below with every other year acceptance in the ENGT program (i.e. 2021, 2023, etc.)

Enrollment projections with every other year acceptance

	Number of new students	Number of students at start of year in ENGT program	Number of students by end of year (includes 20% attrition)
Fall 2021	12	15	12
Fall 2022	0	12	10
Fall 2023	12	16*	13

**: 6 students will have graduated in Spring 2023*

(This estimate is based on an average of 41% of ENGT majors graduating with the BAS in two years)

5. Resource implications

- **Strategies for lowering lecturer costs:**
 - We have identified full time faculty on campus that are able to contribute TEs to the program.
 - New partnership with UH Hilo: UH Hilo will allow ENGT majors to enroll in its online GEOG 480 course, replacing ETRO 455, Remote Sensing, a course that has been regularly taught by a lecturer.

This strategy will bring the number of lecturers for the ENGT program to zero.

- **Materials and software licenses:** The program rely on the UH Foundation ECET account to purchase materials and renew software licenses. We anticipate that the donor will continue to contribute year after year.

x I am NOT requesting additional resources for my program

