



WICHITA STATE
UNIVERSITY

Program Review

Self-Study Template

Revised 11-15-2021

Academic unit: Electrical and Computer Engineering College: Engineering

Date of last review _____ Date of last accreditation report (if relevant) _____

List all degrees described in this report (add lines as necessary)

Degree: BS in Electrical Engineering CIP* code: 14.1001

Degree: BS in Computer Engineering CIP* code: 14.0901

Degree: MS in Electrical and Computer Engineering CIP* code: 14.4701

Degree: _____ CIP* code: _____

*To look up, go to: Classification of Instructional Programs Website, <http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55>

Certificate (s): N/A

Faculty of the academic unit (add lines as necessary)

(If interdisciplinary, please list your core teaching faculty and department name if external to academic unit)

NAME (List department –if external to unit)	SIGNATURE	TENURE OR NON-TENURE TRACK
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Submitted by: Visvakumar Aravinthan
(Name and title)

Date 5/26/2022
(Date)

In yellow highlighted areas, data will be provided

Please note that the signatures indicate that each faculty has read the self-study template and agreed (by consensus) to its contents.

Part 1: Departmental Purpose, Relationship to the University Mission and Strategic Plan engagement

Please list the program purpose statement. Explain in 1-2 concise paragraphs the role of the program and tie them to the University mission (printed below) and strategic plan.

*The mission of Wichita State University is to be an essential **educational, cultural and economic driver** for Kansas and the greater public good.*

A. Program Purpose Statement - formerly Mission

(If more than one program, list each purpose statement):

BSCE & BSEE: The first program educational objective is aimed for our graduates to be highly successful and content at their jobs and thus being productive members of engineering teams. We **educate** high quality graduates who will contribute to the **economy of Kansas**, and the **greater public good**. The second objective revolves around being successful in graduate school which touches again on the **educational** mission; upon graduation our students will serve the **greater good** in the workforce. We also educate our graduates to be responsible, **cultured** citizens.

MSECE: A Master of Science (MS) in electrical and computer engineering from Wichita State will prepares students for high-demand career options in avionics, process control systems, automation, information processing, computer engineering, communication systems and power and energy systems—as well as for success in a future Ph.D. program by providing strong foundation in the traditional and contemporary areas of electrical and computer engineering.

B. The role of the Program(s) and relationship to the University mission:

BSCE & BSEE: Our programs are especially aligned with the university's mission in driving the economic growth of the State. Our programs prepare students in to support and grow avionics, transportation electrification, renewable energy, cyber-security, and automation through applied learning opportunities.

MSECE: This program has similar goals as our undergraduate programs but with greater focus on educating the students to research and design solutions to engineering problems.

C. Has the purpose of the Program(s) changed since last review? ☐ Yes ☒ No

If yes, describe in 1-2 concise paragraphs. If no, is there a need to change?

D. How does the Program support the university strategic plan?

Describe in 1-2 concise paragraphs.

BSCE & BSEE: The first program educational objective is aimed for our graduates to be highly successful and content at their jobs and thus being productive members of engineering teams. We **educate** high quality graduates who will contribute to the **economy of Kansas**, and the **greater public** good. The second objective revolves around being successful in graduate school which touches again on the **educational** mission; upon graduation our students will serve the **greater good** in the workforce. We also educate our graduates to be responsible, **cultured** citizens.

E. Provide an overall description of your program (s) including any changes made since the last review?

BSCE refer to Criterion 2: Program and Educational Objectives in ABET Self-study page 16

BSEE refer to Criterion 2: Program and Educational Objectives in ABET Self-study page 17

MSECE The MSECE program is a flexible degree program for students who seek an advanced professional career in this field. It also gives critical knowledge to pursue a PhD in Electrical Engineering. Students of the program have the opportunity to build a strong foundation in physical science and mathematics, while exploring key sub-disciplines in Communication & Signal Processing, Computing Systems, Control Systems & Robotics, and Power & Energy Systems, to achieve a thorough command of their chosen sub-disciplines. The program's curriculum and the department's state-of-the-art laboratories prepare students to develop creative solutions to real-world engineering problems in a global economy. Students of this program are actively sought after by local companies through the university's Cooperative Education opportunity. This provides students with invaluable job experience, financial assistance, and contacts for potential full-time jobs after graduation. The MSECE degree requires the satisfactory completion of a Plan of Study, which must be filed within the first 12 credit hours of graduate course work. The plan of study must be approved by the student's advisor and the MSECE graduate coordinator. Three options are available: (1) the thesis option requires a minimum of 24 hours of course work plus a minimum of 6 hours of thesis, (2) the directed project option requires a minimum of 27 hours of course work plus a minimum of 3 hours of directed project, and (3) the course work option requires a minimum of 20 hours of course work. Each MSEE student chooses a major and a minor specialization area. Current major areas in the department are Communication & Signal Processing, Computing Systems, Control Systems & Robotics, and Power & Energy Systems. Any of these can also be chosen as a minor area. In addition, Networking can be a minor area. Each option requires a certain number of course in the major area and a certain number of course in the minor area. The plan of study must also have 60 percent of the hours at the 700 level or higher. The plan of study must also have nine of the hours at the 800 level or higher. The objectives of the MS in Electrical Engineering program are to prepare students for

1. advanced careers in electrical engineering and related fields
2. further graduate study.

Part 2: Faculty Quality and Productivity as a Factor of Program Quality

*The quality of the program/certificate as assessed by the strengths, productivity, and qualifications of the faculty in terms of scholarly/creative activity and service. (Refer to instructions in the WSU Program Review Instructions for more information on completing this section. **Tables 4 (Instructional FTE), 6 (Program Majors) and 7 (Degree Production) from OPA can be used to help with this section.**)*

The unit was created in July 2021 and such the report is partial based on the current faculty who were in EECS Department prior to the formation of ECE Department

Table 1 Departmental Outputs																	
Scholarly Productivity	Number Journal Articles		Number Presentations		Number Conference Proceedings		Performances			Number of Exhibits		Creative Work		No. Books	No. Book Chaps.	No. Grants Awarded or Submitted	\$ Grant Value
	Ref	Non-Ref	Ref	Non-Ref	Ref	Non-Ref	*	**	***	Juried	****	Juried	Non-Juried				
2017-2018	4	0	17.6	0	13.6	0	-	-	-	-	-	-	-	-	-		
2018-2019	4	0	19.0	0	13.0	0	-	-	-	-	-	-	-	-	-		
2019-2020	5.3	0	12.8	0	6.8	0	-	-	-	-	-	-	-	-	-		
2020-2021	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Complete the table below for the faculty who support the program (all faculty who signed or should have signed the coversheet).

*Winning by competitive audition. **Professional attainment (e.g., commercial recording). ***Principal role in a performance. ****Commissioned or included in a collection.

A. Briefly explain the standards in place in your college/department for the evaluation of your faculty research/scholarship/creative activity. If an interdisciplinary program, please report on the program where faculty research has been recorded and provide narrative related to productivity.

ECE Department faculty needs to improve the salary activities. Most of the conference proceedings in ECE department are peer reviewed and electronically achieved. This requires faculty to increase the contribution significantly when they extend the work for a journal publication. In the past five years investment on ECE programs was limited, this is evident though the number of untenured faculty in the department. As a department, we are in a rebuilding phase, and we are inventing on programs to boost faculty productivity. We are confident that Department would be in a better situation during next review cycle.

B. Provide a brief assessment of the quality of the faculty/staff using the data from the table above. Include details related to productivity of the faculty including scholarship/research and creative activity and services. (i.e., some departments may have a few faculty producing the majority of the scholarship, service, efforts to recruit/retain faculty, departmental succession plans, etc.)

BSCE: Refer to Criterion 6.A of ABET Report (Page 36)

BSEE: Refer to Criterion 6.A of ABET Report (Page 37)

MSECE: As of May 18, 2022, the ECE Department has 7 tenured faculty members who support our graduate program. The following faculty, with a Ph.D., support the program by teaching graduate level classes and conducting research: (i) V. Aravinthan, A. Asaduzzaman, Y. Ding, A. Eslami, H. Kwon, C. Pang, and J. Watkins.

These faculty members have been actively publishing their work in journals and in conference proceedings. Also, our faculty submit grant proposals routinely some of them have funded projects. Our faculty participate in grant reviews, serve as editors of journals, be a part of conference organizing committees, serve in professional organizations and spend summer in research labs to advance their research program. These activities ensure the quality of our faculty.

Part 3: Academic Program(s) and Emphases

Analyze the quality of the program as assessed by its curriculum and impact on students for each program (if more than one). Attach updated program assessment plan(s) as an appendix (*refer to instructions in the WSU Program Review document for more information*).

A. Undergraduate programs:

1. Please review Table 8 provided by the Office of Planning and Analysis. Is the program ACT below 20 (triggered by KBOR defined Minima)? ☐ Yes ☒ No

If yes, please explain the average ACT scores for your students.

B. Graduate programs:

1. Please review Table 9 provided by the Office of Planning and Analysis. Is the program GPA below the university average? ☐ Yes ☒ No

If yes, please explain the average GPA of your graduate students.

C. Accreditation status: If accreditation is previously noted, please add:

Accrediting Body: Accreditation Board for Engineering and Technology, Inc. (ABET)

Next Review Date: July 1, 2026

Commendations and concerns from the last review:

BSCE: No concerns.

BSEE: Has a concern regarding faculty. Not having a faculty member to teach electronics related classes was identified as a concern.

D. Assessment of Learning Outcomes

1. Complete the table below with program level data. Identify the principal learning outcomes (i.e., with what skills does your Program expect students to graduate) and provide aggregate data on how students are meeting those outcomes

You may add an appendix to provide more explanation/details. (If specialty accreditation has been conferred within 18 months of this process, programs can append the information from the accreditation document to this self-study and cite, with page number, the appropriate information. If specialty accreditation has not been affirmed within 18 months, please complete the table or submit an updated version of your accreditation information. If not accredited, please complete the table below.)

BSCE Refer appendix 1 of ABET BSCE Self-study

BSEE Refer appendix 1 of ABET BSEE Self-study

MSECE

Table 2 Learning Outcome Assessment					
Learning Outcomes (most programs will have multiple outcomes)	Assessment Type (e.g., portfolios, exams)	Assessment Tool (e.g. rubrics, grading scale)	Target/Criteria (desired program level achievement)	Results	Analysis
Students will have basic understanding of dynamic systems and feedback control	Comprehensive exam	Final grade	85% of the students will have B- or better grade	72.09%	Proficient knowledge is not demonstrated, and we are planning to have workshops for first semester students.
<p>Definitions: <u>Learning Outcome:</u> Learning that should result from instruction. <u>Assessment Type:</u> Type of assessment used to identify, collect, and prepare data to evaluate the achievement of learning outcomes (e.g., a writing project evaluated by a rubric). <u>Assessment Tool:</u> Instrument used to evaluate the achievement of learning outcomes. <u>Criterion/Target:</u> Percentage of students expected to achieve the desired outcome for demonstrating program effectiveness (e.g., 90% of the students will demonstrate satisfactory performance on a writing project). <u>Result:</u> Actual achievement on each learning outcome measurement (e.g., 95%). <u>Analysis:</u> Determines the extent to which learning outcomes are being achieved and leads to decisions and actions to improve the program. The analysis and evaluation should align with specific learning outcome and consider whether the measurement and/or criteria/target remain a valid indicator of the learning outcome as well as whether the learning outcomes need to be revised</p>					

2. Provide an analysis and evaluation of the data by learner outcome with proposed actions based on the results listed in Table 2. Data should relate to the goals and objectives of the program as listed in Part 1.

BSCE Refer Appendix I of ABET BSCE Self-study page 316

BSEE Refer Appendix I of ABET BSEE Self-study page 316

MSECE Based on the learning outcomes we have identified that significant number of our students are underprepared. As a result, we are in the process of introducing a zero credit our mandatory course for all our MSECE students. The course is being formalized at the Department graduate committee level.

E. Assessment of Student Satisfaction

MSECE program does not have a capstone or certification to compare student success.

BSCE and BSEE students enroll in capstone together but do not have national averages to compare. Every student who graduates from the programs would have completed the capstone. Therefore, nothing to report in Table 3.

Table 3 Student Learning Outcomes Comparison

Aggregate data supporting student success, by year, for the last four years (e.g., capstone, licensing/certification exam pass-rates)				
Year	N	Name of Exam	Program Result	National Comparison±
2016-17		N/A		
2017-18		N/A		
2018-19		N/A		
2019-20		N/A		

3. Use Table 3 and **OPA Table 10** to provide analysis and evaluation using student majors' satisfaction (e.g., exit surveys from the Office of Planning and Analysis), capstone results, licensing or certification examination results (if applicable), employer surveys or other such data that indicate student satisfaction with the program and whether students are learning the curriculum (for learner outcomes, data should relate to the outcomes of the program as listed in 3d) to illustrate student satisfaction with the program and perceptions of program value.

BSCE: from 2016 to 2020 60.2% have indicated they are satisfied with the program. This is in lower than the College and needs improvement. One of the needs is to increase the technical electives in the areas of internet of things, embedded systems and hardware security.

BSEE: from 2016 to 2020 64.2% have indicated they are satisfied with the program. This is in par with the College but needs improvement. Starting Spring 2022 we have a committee that is looking into the curriculum and improving the student experience by incorporating more applied learning experience through design classes.

MSECE: from 2016 to 2020 86.5% have indicated they are satisfied with the program. This is in par with the College and university.

F. General Education

1. Does your program support the university General Education program? ☐ Yes ☒ No

If yes, please complete the table below by listing the general education courses and noting which of the general education outcomes are addressed in the class. If no, skip this question.

Table 4 General Education Outcomes

Course	Results	Assessment Type	General Education Outcomes			
			Have acquired knowledge in the arts, humanities, and natural and social sciences	Think critically and independently	Write and speak effectively	Employ analytical reasoning and problem-solving techniques

Note: Not all programs evaluate every goal/skill. Programs may choose to use assessment rubrics for this purpose. Sample forms available at:

<http://www.aacu.org/value/rubrics/>

2. Use Table 4 to further explain which goals of the *WSU General Education Program* are assessed in undergraduate programs (optional for graduate programs) and the results.

G. Concurrent Enrollment

1. Does the program offer concurrent enrollment courses? ☐ Yes ☒ No

If yes, provide the assessment of such courses over the last three years (disaggregated by each year) that assures grading standards (e.g., papers, portfolios, quizzes, labs, etc.) course management, instructional delivery, and content meet or exceed those in regular on-campus sections.

If no, skip to next question.

H. Credit Hours Definition

1. Does the Program assign credit hours to courses according to Wichita State University Policy 2.18?

☒ Yes ☐ No

If no, provide explanation.

I. Overall Assessment

1. Define the overall quality of the academic program based on the above information and other information you may collect, including outstanding student work (e.g., outstanding scholarship, inductions into honor organizations, publications, special awards, academic scholarships, student recruitment and retention).

ECE Department is newly formed in Fall 2021 with the concise resources available to the Department we have been going through a strategic planning initiative to identify our strengths and needs. In consultation with the Electrical and Computer Engineering (ECE) faculty, students and the ECE Industry Advisory Board, a plan is developed in Fall 2022 to meet future employment and research needs in electrical and computer engineering.

Based on the faculty and industry advisory board feedback, the following are considered as success indicators.

- **Knowledge:** Graduates having strong theoretical understanding of how to solve engineering problems. Also, graduates should be able to understand the application needs and apply the theory learned in the school.
- **Employment:** Diversity in region, size and starting salaries in companies that want to hire our students. Companies feeling, they need to provide equal or lower training to our graduates compared to other regional ECE programs.
- **Research:** Success in research can be measured through two directions. Research publications and Ph.D. student placement indicates as a department we have been successful is training our students. External funding indicates the relevance of our research and our faculty's ability to competitive in their area of research.
- **Other:** Students graduating with real-world experience through internships or industry sponsored projects and senior design. Our faculty being recognized by their professional societies.

Specific program outcomes are as follows:

BSCE Refer annexure I of the ABET BSCE self-study page 280

BSEE Refer annexure I of the ABET BSEE self-study page 281

MSECE: This program is designed to ensure that its students demonstrate the following:

1. An ability to self-educate

Students complete the program with either a thesis, project, or just coursework. Thesis and project students will be evaluated by their advisor on the ability demonstrated to self-educate. Coursework students must take at least one course that contains a research project involving self-education. Evaluation of such students will be performed by the course instructor.

2. **Communicate effectively**

Thesis and project students will be evaluated by their advisor on their written and oral communication, and coursework students by the instructor of the course taken by them containing the research project, which will also involve submission of a written report.

3. **Competency in core areas**

Students of this program graduate with one of four major areas: Communication & Signal Processing, Computing Systems, Control Systems & Robotics, or Power & Energy Systems. The competency of the students in the chosen major area will be measured and reported by the instructors of selected courses in these areas.

4. **A knowledge of professional and ethical responsibility**

All students of the program need to pass 4 CITI modules, namely Research Misconduct, Authorship, Conflicts of Interest, and Data Management. The passing grade in each module is 80%. Students graduate only after passing each module; thus, all our graduating students demonstrate this knowledge.

Due to COVID and recent realignment of departments these are not available for period before Fall 2021.

Criteria 1 and 2 were tested in one of the core classes ECE 711 and 76.2% of the students showed they have the ability to self-educate and 66.67% of the students showed they communicate effectively. 100% of the students met Criteria 3 and 4

As we try to reach our goals of increasing enrollment, we identified the following as our immediate needs:

- **Design thinking:** students graduating from the program should have the ability to work in interdisciplinary teams and be able to solve engineering problems. This requires the focus on the following: (i) understanding the design needs; (ii) students should be able to communicate with the stakeholders and understand the design requirements and limitations.; (iii) understanding operational limitations, standards, and safety procedures (iv) documentation and (v) Effectively communicating with stakeholders.
- **Course Needs:** we have identified the following as course needs: (i) a course that covers semiconductor packaging, testing, and analog circuit design; (ii) a course that covers modeling, simulation, and data analytics; (iii) a course that covers automation and robotics from the application viewpoint; (iv) computer networks, network security, communication protocols and instrumentations; and (v) variable frequency drives, motor control and risk analysis
- **Laboratory Needs:** increase design and analysis experience among our students. This includes revamping our labs and introducing design thinking classes. Specific needs are: (i) A junior level design lab course that would introduce basics of design requirements; (ii) a laboratory that would incorporate contemporary topics such as internet of things, embedded systems, application specific integrated circuits and printed circuit boards which can help the students apply the theory covered in different subjects; (iv) advanced automation laboratory that would incorporate control systems, intelligent electronic devices, and programmable logic controllers.

Part 4: Student Need and Employer Demand

Analyze the student need and employer demand for the program/certificate. Complete for each program if appropriate (refer to instructions in the *WSU Program Review document for more information on completing this section*).

Complete the table below.

Table 5 Employment of Majors 2020-2021							
Program Name	Avg. Salary	Employment In state (%)	Employment in the field (%)	Employment related to the field (%)	Employment outside the field (%)	Pursuing graduate or professional education (N)	Projected growth from BLS**
Electrical Engineering	\$101,780	~ 68%	~70%	~10%	~5%	~15%	7%
Computer Engineering	\$128,170	~ 66%	~70%	~10%	~5%	~ 15%	2%

* https://ksdegreestats.org/program_search.jsp and U.S. Bureau of Labor Statistics Website: <http://www.bls.gov/oco/> are good resources to view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data).

List any triggered programs with reason (majors/faculty/graduates).

1. N/A

A. Provide a brief assessment of student need and demand using the data from **Tables 11-15** from the Office of Planning and Analysis and from the table above. Include the most common types of positions, in terms of employment graduates can expect to find. Programs that are triggered for graduates or majors should get particular attention.

BSCE applications and enrollment has been steady for past 8 years. With our Intergra Technologies is requiring more engineers and NepAPP moving to innovation campus we have the ability to attract more students.

BSEE applications and enrollment is fluctuating in the last three years. With the projected job rate being 7% and huge local interest in renewable energy and relationship with Evergy and Sunflower Electric and the recent interest in transportation electrification (Textron acquiring a electric plane company and CNH acquiring a electric tactor company) the interest in electrical engineering will grow and the department is investing on increasing the visibility.

MSECE students get recruited around the country both by industry and academia for Ph.D. studies. By focusing on automation and robotics in addition to the current focus areas (controls, communication, computing systems and power systems) we will be able to further increase the demand of this program.

B. Briefly describe how the department and faculty have engaged in undergraduate strategic enrollment management including recruitment and retention activities and provide an assessment of successes, challenges, and deficiencies with those activities.

Two of our faculty members served as retention fellows in 2021 / 2022 and one of our faculty members will serve as a recruitment fellow. As a department we support our faculty to engage in these activities. For example, last fall we hosted series of seminars to support the retention needs.

Department chair participates in recruitment related school visits organized by the College of Engineering. For example, in Spring 2022 we visited Dodge City and Garden City to visit high schools.

Also, we have worked with Highschool students and invited them to be volunteer researchers in summer. We had three students work as volunteer researchers in our labs last year.

One of the common feedback from employers and our students is that they get minimum exposure to design and applied learning. Department curriculum committee is currently working on improving our curriculum to incorporate design and applied learning-based courses.

Similarly based on the feedback from other engineering departments and industry advisory board we are in the process of revising the first course in electrical engineering.

Our department faculty and staff are heavily involved in routine recruitment and retention activities such as:

1. Developing a new first year seminar to introduce electrical and computer engineering to the students.
2. Our honor society advisor coordinates free tutoring program for courses offered by our department
3. We encourage our students to participate in the professional societies and especially participating in IEEE Region 5 student competitions.
4. Host campus visitors with a lab tour and open our labs during Engineering Open House

Our challenge with the BSCE program recruitment and retention is lack of faculty strength. We have only two faculty members who have the necessary background to teach computer engineering classes. One of them solely supports our computer engineering track in the graduate program as such he teaches only on undergraduate class per semester, this has created a significant challenge in terms of offering technical electives and balance it with the core classes. This program needs an additional computer engineering faculty member who focuses on internet things, embedded systems, real-time computation etc.

*C. Briefly describe how the department and faculty have engaged in **graduate** strategic enrollment management including recruitment and retention activities and provide an assessment of successes, challenges, and deficiencies with those activities.*

Strength of our graduate program:

Based on the historic background, support from Evergy in developing a Microgrid lab in JBC and the funding and class offering by Sunflower Electric we have a very strong power program. With the recent interest in transportation electrification and automation, we are in the process of strengthening our embedded systems and controls program. The strong collaboration we have with Airforce Research Laboratories provides as the necessary research and teaching infrastructure for communication systems.

Challenge:

A significant number of our graduate students are international students and COVID-19 has affected the visa and travel process. As such, we believe that enrollment growth will be a challenge until international travel becomes unrestricted. Recently we have seen increase in both applications and enrollment.

ECE Department identified the following growth plan for MSECE program in Fall 2021:

Our target goal is to have, on average, three research students per faculty and increase the enrollment to 150 students by 2025 and maintain the enrollment at 150. We would like to have the enrollment capped at 150 mainly due to the faculty size and to limit the graduate level class size to 30 students. In order to provide an effective educational experience and applied learning projects we will have to enforce these limits. If we can offer additional classes, for every two additional classes that we can offer hire additional faculty members in computer engineering, we will be able to increase the enrollment by 30 students per faculty. Some of the measures undertaken by the ECE Department to increase the enrollment are:

- Since most of our students are international students, we are closely working with the Graduate School to increase our visibility. We have created a digital flyer that we are planning to share with the graduate school and place on our department webpage. We will also provide more information about our program and career opportunities to the agents who are working with graduate admissions so that our program can be better marketed internationally.
- We are creating focus areas and strengthening industry partnerships and course offerings in these focus areas to help improve the student experience. This should provide the ability to sustain our enrollment.
- In Spring 2021 we have reevaluated our MSECE degree and changed the graduation requirements. As a part of this process, we have reduced the required credit hours to 30 credit hours for all graduating options. This will allow us to be more compatible with other institutions.
- Based on an informal survey conducted at the department level, most of the students would prefer to have some courses in embedded systems, automation, and data analytics. We are in the process of strengthening our courses to meet these needs.

- Focused graduate certificates will allow our students to be more competitive and attract more students. Also, this will appeal to practicing professionals to take our classes. We are focusing on the following graduate-level certificates:
 - **Power system regulations, policy, and planning:** This is a need identified by the industry and our industry partners are providing support in terms of material and teaching assistance to make this an industry-centric graduate certificate.
 - **Advanced automation and embedded controls:** Embedded systems, control, and software applications are becoming a future trend especially with an advanced computer chip. Based on the local needs and over strengths we would like to create a certificate that would provide necessary tools to make our students more marketable.
 - **Electrification of vehicle systems:** with the recent interest in transportation electrification and investments from local companies, this is a great opportunity to build a string program that would be unique in the country.
- If our students get better job placement, it will help us with student recruitment. We are in the process of creating a strategic plan to work closely with local industries. We are planning on seeking industry collaboration through senior design projects, research projects, and increasing student-engineer interactions.
- We are in the process of creating an Alumni Advisory Board to help us improve the student experience and use their success as a part of our recruitment.

Our current application pool is heavily concentrated in one region of the world. This creates challenges in terms of attracting more students as several programs are targeting the same region. We are trying to diversity our target recruitment and our faculty have participated in seminars and workshops in China, Bangladesh, and Sri Lanka to improve our visibility in these countries.

We are creating videos of our students to highlight their achievements and share it in our webpage as a recruitment tool. We are currently working with MRC and should be able to complete the videos by June 2022.

D. Also address students enrollment, degree production and employment outcomes for diverse students.

Traditionally electrical engineering programs were not attractive to women. To help us improve this trend we have created an affinity group called “Women in ECE.” Ms. Manira Rani is spearheading this initiative.

Summary of Under-represented Minority (URM) enrollment data for both the undergraduate and graduate programs is given in the table below. Data from 2020 is not available to the department at the time the reporting.

Group	2016	2017	2018	2019
BSCE Freshman & Sophomores	21.4%	20.9%	20.3%	18.5%
BSCE Juniors & Seniors	12.1%	8.5%	9.8%	14.1%
BSEE Freshman & Sophomores	13.8%	16.1%	12.1%	20.3%
BSEE Juniors & Seniors	11.8%	15.8%	14.4%	15.5%
Masters	4.1%	8.6%	6.3%	3.8%

Summary of Under-represented Minority (URM) degree confirmed data for both the undergraduate and graduate programs is given in the table below

Group	2016	2017	2018	2019	2020
BSCE	0.0%	5.0%	5.9%	15.0%	4.9%
BSEE	13.0%	9.3%	13.9%	15.9%	11.4%
MSECE	0.0%	0.0%	12.5%	10.5%	0.0%

Part 5: Program Service

Analyze the service the Program/certificate provides to the **discipline, other programs at the University, and beyond**. Complete for each program if appropriate. **Data tables 1, 2, 3 and 5a, b and c provided by the Office of Planning Analysis (covering SCH by FY and fall census day, instructional faculty; instructional FTE employed; program majors; and degree production) can be used to partially address this section.** (Refer to instructions in the WSU Program Review document for more information on completing this section).

A. Provide a brief assessment of the service the Program provides using SCH by majors and non-majors.

Attached table provides summary of SCH production by the department as reported by Office of Planning & Analysis Data tables. During this period all the programs were under EECS Department and programs considered EE and CS labeled classes as courses any majors can take.

Major & Student Level SCH	2016	2017	2018	2019
Total	2736	2365	2455	1927
Program Undergraduate Majors	1404	1166	1059	834
Program Graduate Majors	567	397	366	253
Non-program Majors	765	802	1030	840

Based on this data credit hour production is in the decreasing tend. Since the formation of ECE Department we have taken measures to increase our enrollment. We have been having more effective campus visitor tours and also actively recruiting international graduate students. As ECE Department stabilizes in next two years we expect our enrollment to grow significantly.

B. Provide a brief assessment of the service the Program/certificate provides to other university programs.

ECE Department supports aerospace, mechanical, computer science, industrial and biomedical engineering programs with foundational courses (Example: ECE 194, ECE 282, ECE 238 etc.). Based on the regular assessments it is evident that the students are meeting the expected outcomes. Table below provides the % SCH taken by other majors. As it can be seen ECE provides significant service to other university programs.

Major & Student Level SCH	2016	2017	2018	2019
Program Undergraduate Majors	51.32%	49.3%	43.14%	43.28%
Program Graduate Majors	20.72%	16.79%	14.91%	13.13%
Non-program Majors	27.96%	33.91%	41.96%	43.59%

C. Provide a brief assessment of the service the Program/Certificate provides to the institution and beyond.

Our programs are designed to meet the needs of electrical and computer engineers in Kansas and beyond. Our program educational objectives are based on ABET:

1. ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. ability to communicate effectively with a range of audiences
4. ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. ability to acquire and apply new knowledge as needed, using appropriate learning strategies

The ECE department's faculty participates in all major committees in the university, the college, and the department. Our faculty are involved in shared governance, and committees that serve the greater good. As the department is research-active, it provides significant visibility to the University by having faculty on research review panels, journal, and conference technical committees, organizing committees for conferences, local chapters of societies (e.g., IEEE). Again, due to research-activity our faculty represents their work and their university during conference and professional meetings by presenting their state-of-the-art engineering/science work.

Part 6: Impact of Previous Self-Study Recommendations

At the conclusion of the last program self-study performed, the committee provided recommendations for improvement for the department. Please list those recommendations and note your progress to date on implementation.

Committee Recommendation from last review?

☒ Forward Facing Goals Accepted ☐ Forward Facing Goals Resubmitted (Date _____)

Internal Follow-up Recommendation:

☐ 2-year Follow-Up ☒ NA

KBOR Recommendation:

☐ Enhanced ☐ Maintained ☐ Monitored for improvement ☐ Discontinued

Complete the table.

Table 6 Changes made based on Previous Recommendations

Recommendation	Activity	Outcome

Part 7: Program Forward-Facing Goals from Last Review

Report on the Program’s/certificate’s goal (s) from the last review. List the goal(s), data that may have been collected to support the goal, and the outcome. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

Complete the table.

Table 7 Results of Goals from Last Review

(For Last 4 FYs)	Goal(s)	Assessment Data Analyzed	Outcome	Status (Continue, Replace, Complete)

Part 8: Forward-facing Goals

Identify goal(s) for the Program to accomplish in time for the next review. Goals must be **Specific, Measurable, Attainable, Realistic and Time-bound (SMART)** and should be tied to the university and college strategic plans.

Complete the table.

Table 8 Forward Facing Goals for Program Review Period

Program/Certificate Goal	Specific	Measurable	Attainable	Realistic	Time-bound
Increase the tenure track faculty to support all the programs offered by the department.	Yes – in three-year plan we seek four tenure tack faculty from the Dean of Engineering	Yes	Yes – contingent upon budget availability	Yes – based on the needs	Yes – Fall 2025
Enriching the curriculum through problem-solving skills, hands-on experience, and design thinking	Yes – create a series of courses 1xx – 4xx that provide design experience	Yes	Yes – contingent upon hiring a new faculty member	Yes	Yes – Spring 2024
Increase MSECE enrollment	Yes - 150 students per year	Yes	Yes – based on the ability to provide certificates	Yes	Yes – Fall 2023
Increase industry involvement at undergraduate level	Yes – increase industry sponsored senior design projects by 100%	Yes	Yes	Yes	Yes – Fall 2024
Influencing the community through fundamental scientific research and industry-driven applied research	Yes – increase externally funded research by 300%	Yes	Yes	Yes – based on the current level of department funding	Yes – Fall 2025

Program/Certificate Goal	Specific	Measurable	Attainable	Realistic	Time-bound
Enhance the visibility of the undergraduate programs	Yes – engage undergraduates in research by 200% and purification in professional competitions by 300%	Yes	Yes	Yes	Yes – Fall 2025
Enhance the quality of the graduate programs	Yes – increase the graduate student publication and participation in professional conferences by 100%	Yes	Yes	Yes	Yes – Fall 2024

Provide any additional narrative covering areas not yet addressed.

N/A