CONNECTICUT BOARD OF REGENTS FOR HIGHER EDUCATION
Connecticut State Colleges & Universities
*APPLICATION FOR **NEW PROGRAM APPROVAL***

SECTION 1: GENERAL INFORMATION

Institution: Central Connecticut State University	Date of Submission to CSCU Office of the Provost: January 29, 2020
Most Recent NECHE Institutional Accreditation Action and Date: April 12, 2019	
Program Characteristics Name of Program: **Electrical Engineering** Degree: Title of Award *(e.g. Master of Arts)* **Bachelor of Science** Degree Certificate: *(specify type and level)* Stand-Alone Certificate: *(specify type and level)* Anticipated Program Initiation Date: Fall 2020 Anticipated Date of First Graduation: May 2024 Modality of Program: X On ground Online Combined If "Combined", % of fully online courses? Locality of Program: XOn Campus Off Campus Both	**Program Credit Distribution** # Credits in General Education: 42 # Credits in Program Core Courses: 61 # Credits of Electives in the Field: 0 # Credits of Other Electives: 0 # Cr Special Requirements *(include internship, etc.):* 22 Total # Cr in the Program *(sum of all #Cr above)*: 125 From "Total # Cr in the Program" above, enter #Cr that are part of/belong in an already approved program(s) at the institution: 67
NOTE: All applications to establish a new program will be considered for both Licensure and Accreditation by the BOR	
CIP Code Number 14.1001 Title of CIP Code Electrical and Electronics Engineering	
If establishment of the new program is concurrent with discontinuation of related program(s), please list for each program: Program Discontinued: CIP: OHE#: BOR Accreditation Date: Phase Out Period Date of Program Termination	
Institution's Unit *(e.g. School of Business)* School of Engineering, Science, and Technology Location *(e.g. main campus)* Offering the Program: Main campus	
Other Program Accreditation: • If seeking specialized/professional/other accreditation, name of agency and intended year of review: ABET, 2025 • If program prepares graduates eligibility to state/professional license, please identify: Professional Engineering License from CT Occupational & Professional licensing Division *(As applicable, the documentation in this request should addresses the standards of the identified accrediting body or licensing agency)*	

Institutional Contact for this Proposal: Dr. Shuju Wu	Title: Professor and Chairperson of Computer Electronics and Graphics Technology	Tel.: 860-832-3334 e-mail: swu@ccsu.edu

SECTION 2: PROGRAM PLANNING ASSESSMENT

Alignment of Program with Institutional Mission, Role and Scope
(Provide concise statements)

Mission of Central Connecticut State University (CCSU):
Central Connecticut State University is a community of learners dedicated to teaching and scholarship that emphasizes development and application of knowledge and ideas through research and outreach activities, and prepares students to be thoughtful, responsible and successful citizens. As a comprehensive public university, we provide broad access to quality degree programs at the baccalaureate, master's, and doctoral levels.

Mission of the School of Engineering, Science, and Technology (SEST):
The School of Engineering, Science and Technology will strive to provide an innovative and unique educational experience to every student, develop the most qualified engineers, scientists and technologists. The School will maintain academic excellence in a wide variety of traditional disciplines and develop innovative disciplines in emerging fields, creating interdisciplinary educational and research programs, and building the infrastructure to support the expansion of programs.

The School will be a leader in developing cross-disciplinary initiatives that combine and expand the talents of its students and faculty in all disciplines and prepares our graduates for a multidisciplinary world through a flexible and diverse curriculum; and, meets the needs for a well-educated and skilled workforce.

The School of Engineering, Science, and Technology will provide premier undergraduate and graduate programs in engineering, technology, computing, life and physical sciences, and mathematics. The School will provide a technology-rich, and interdisciplinary learning environment that offers students a rewarding academic experience through experiential and active learning that embraces the concept of "**thinking, learning, and doing**."

The School will strive to serve a student population that mirrors the diversity of the region and includes many international students. The School aspires to be a leading force in offering a number of creative outreach programs designed to encourage and support all students to pursue careers in science and engineering.

Proposal and Rationale:
The Computer, Electronics and Graphics Technology Department (CEGT) within the School of Engineering, Science, and Technology (SEST) at Central Connecticut State University proposes a Bachelor of Science in Electrical Engineering (BSEE). This program would support the mission and vision of the CSCU System by increasing the footprint of education in applied fields and professional disciplines.

The BSEE program will serve the citizens of Connecticut, New England region, the United States, and the world by educating and preparing our graduates to succeed as professional engineers, leaders, lifelong learners, and responsible citizens. The educational goals of BSEE program include developing students' awareness of societal impacts and individual responsibility. This goal is consistent with CCSU's mission of preparing students to be thoughtful, responsible and successful citizens. As part of the CEGT department which features dedicated, quality-based, hands-on, applied, and student-first education, the proposed BSEE will contribute to CCSU's mission and be consistent with CCSU's role as one of the state's leading public universities to provide affordable, accessible, and quality degree programs. The affordability and accessibility of CCSU will allow a diverse population to gain greater earning potential that will in turn promote economic growth and social justice.

The creation of BSEE degree will contribute to meeting CCSU's strategic goals of increased student enrollment and expanding community engagement by providing an affordable, accessible educational program that addresses and fits local

and regional industry needs. Graduates from the program will form a pipeline of employment to energy and power plants, consulting and design corporations, and service groups.

The BSEE will contribute to the mission of the School of Engineering, Science, and Technology (SEST) by providing innovative and unique educational experiences and preparing qualified engineers in electrical engineering. The BSEE offers students the opportunity to build knowledge and skill in both traditional applications of electrical engineering as well as innovative applications in emerging fields. The program curriculum includes courses and laboratories in both traditional electronics, electrical and power engineering, and renewable energies, thus positioning the program for future development, research, and interdisciplinary education. Currently, SEST offers two undergraduate engineering programs: the BS in Mechanical Engineering and BS in Civil Engineering. The BSEE is not only an important expansion to the school's offerings but also could create synergy and collaborations among programs including mechanical engineering, computer engineering technology, cybersecurity, engineering physics, and robotics technology. Therefore, the proposed BSEE directly connects with SEST's mission for quality, innovative, and interdisciplinary education.

The BSEE will build upon CCSU's numerous strengths, including the new engineering building to be opened in 2021. This building ensures the availability of the necessary classrooms and laboratories to offer a high-quality bachelor's-level engineering degree that is well positioned for external accreditation. Before the new building opens, CCSU expects to enroll approximately 25 EE students who would be taking lower-level electronics courses, which can be housed in our current facilities. Consequently, we are able to launch this program now by leveraging existing space and resources from the CEGT department, the Manufacturing and Construction Management department, and the Physics department.

BS in Electrical Engineering Mission Statement:

The mission of the BSEE is to provide students with a broad and thorough education in Electrical Engineering fundamentals, applications, and design that prepares them to practice as professional electrical engineers with the confidence and skills necessary to meet the technical and social challenges of the future. The degree provides a broad and thorough education in mathematics, physics, chemistry, and engineering coupled with application of modern engineering tools.

BS in Electrical Engineering Vision Statement:

The BSEE will serve the students and state of Connecticut by providing quality education in the practice of engineering. The degree will enable students to practice in a profession that contributes to technical and economic innovation while enhancing their own economic welfare. The BSEE will emphasize undergraduate education through quality instruction with a strong focus on analysis and design.

All points above including the proposed mission and vision statements for the Electrical Engineering baccalaureate program are consistent with the stated goals and mission statements of CCSU and the School of Engineering, Science, and Technology. They also satisfy the workforce development needs of the State.

Addressing Identified Needs

- How does the program address CT workforce needs and/or the wellbeing of CT communities – and include a description/analysis of employment prospects for graduates of this proposed program *(Succinctly present as much factual evidence and evaluation of stated needs as possible)*

Roles Electrical Engineers Fill

According to the United States Bureau of Labor Statistics, **Electrical Engineers** typically fill the following roles:

- Design new ways to use electrical power to develop or improve products
- Perform detailed calculations to develop manufacturing, construction, and installation standards and

specifications
- Direct the manufacture, installation, and testing of electrical equipment to ensure that products meet specifications and codes
- Investigate complaints from customers or the public, evaluate problems, and recommend solutions
- Work with project managers on production efforts to ensure that projects are completed satisfactorily, on time, and within budget

The proposed BSEE aims to prepare graduates for these roles.

Workforce Needs and Employment Prospects

On a national level, the United States Bureau of Labor Statistics predicts a 9% growth in employment opportunities for Electrical Engineers between 2016 and 2026. Additional job growth is also predicted for related job titles, which graduates of this program could fill. This growth exceeds the 7% overall growth predicted for all occupations in the United States. These predictions are summarized in Figure 1.

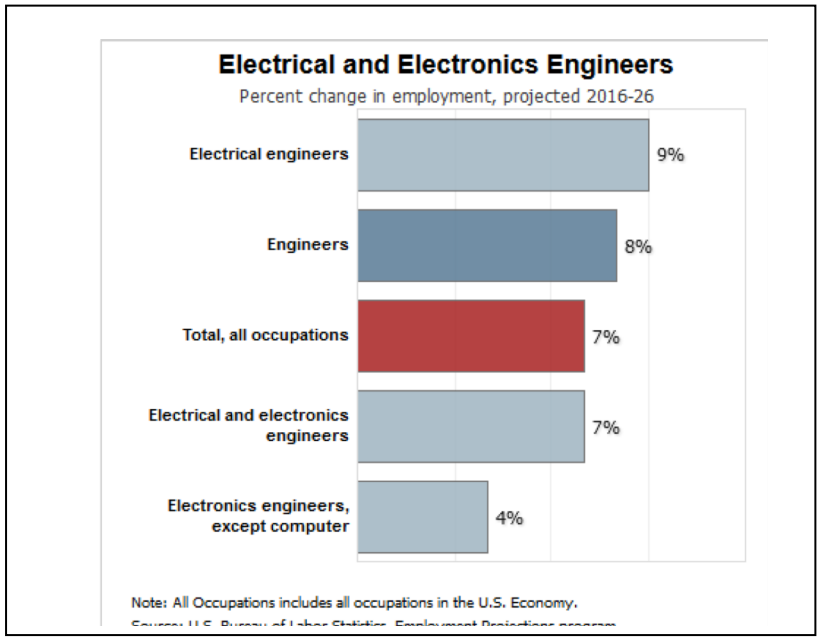

Figure 1. Predicted National Job Growth

Data show a dearth of trained **Electrical Engineers** to fill existing (and future) positions in Connecticut. The Connecticut Department of Labor Employment Projections predicts a 10% increase of Electrical Engineers from 2016 – 2026. Related engineering occupations where our graduates can fit, such as Electronics Engineers, Electrical and Electronics Drafters, Electrical and Electronics Engineering Technicians, also see increases of 2.8%, 16.2%, and 12.1% respectively. In addition, a 2017 survey of Connecticut Manufacturing Workforce Needs by the Connecticut Business & Industry Association (CBIA) reveals a profound need for additional **Electrical Engineers** in the Connecticut workforce. The survey summarizes the state-wide needs for technical occupations, and **Electrical Engineers** are the third most in-demand occupation and the most in-demand occupation with a specific job title with 1,752 positions open, as shown in Table 1.

At the national level, the United States Department of Labor's Occupational Outlook Handbook provides Occupational Employment Statistics (OES), which indicate that occupations related to electrical engineering (electrical, motor, power, etc.) all increase by 2.0% to 13.9%, except for electrical equipment assemblers. These sources suggest that the US, as a whole, will be adding jobs for Electrical Engineers.

We are optimistic that electrical engineers who receive their training at CCSU will help fill this workforce demand. According to the CSCU website, 96% of enrolled CSCU students are Connecticut residents. As shown in Figure 2, historical data from New England's Knowledge Corridor 2004 survey indicates that CCSU graduates tend to live in Connecticut and support the state economy. This result is particularly true for the CEGT students based on our observations of student internships and employment.

Demand for Skilled Workers in Manufacturing by 2018			
Position	**Job Needs Statewide**	**Position**	**Job Needs Statewide**
Entry-level	3324	Warehousing	508
Engineers	2245	CNC Machinists	407
Electrical engineers	1752	Tool and die makers	282
Welders	1650	CNC Programmers	156
Mechanical engineers	1236	Transportation	86
Machinists	1048	CAD/AM	55
Quality control	821	Drivers	31

Table 1. Demand for Skilled Worker in CT

The same type of survey in 2017 on the Greater Hartford, New Haven, and Springfield areas—the second largest population, education, and economic centers in New England and nation's 20th biggest metro region—shows that regional businesses leverage CT's cluster of higher education institutions. Indeed, 50% of hires are from local institutions and 48% of regional businesses offer internships to local students. The survey also claims that 30% of the future workforce will come from urban cores, from which CCSU draws a substantial portion of its enrollment.

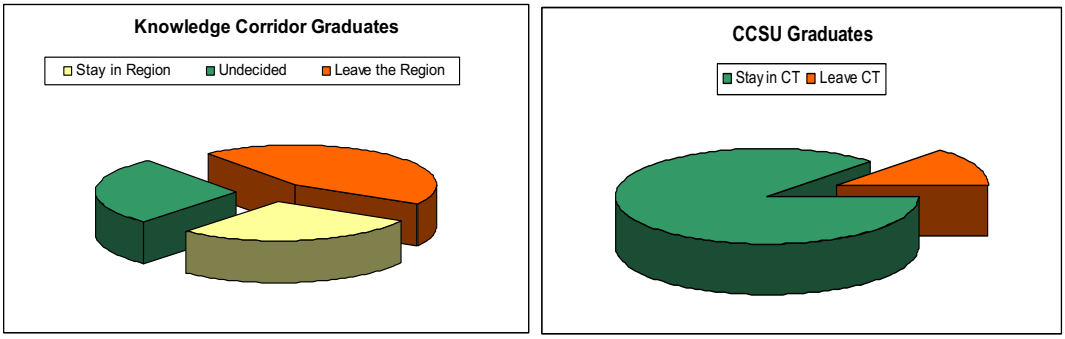

Figure 2. Student Moving Trend after Graduation

The Connecticut State University System has traditionally been an engine of social mobility and economic growth. The addition of BSEE follows in that tradition as it serves industry needs in Connecticut and promotes social mobility. According to the May 2018 estimate from Connecticut Department of Labor, the annual mean wage of an Electrical Engineer is $98,310 as compared to the state median of $60,780.

Training Qualified Electrical Engineers to Meet CT Workforce Needs

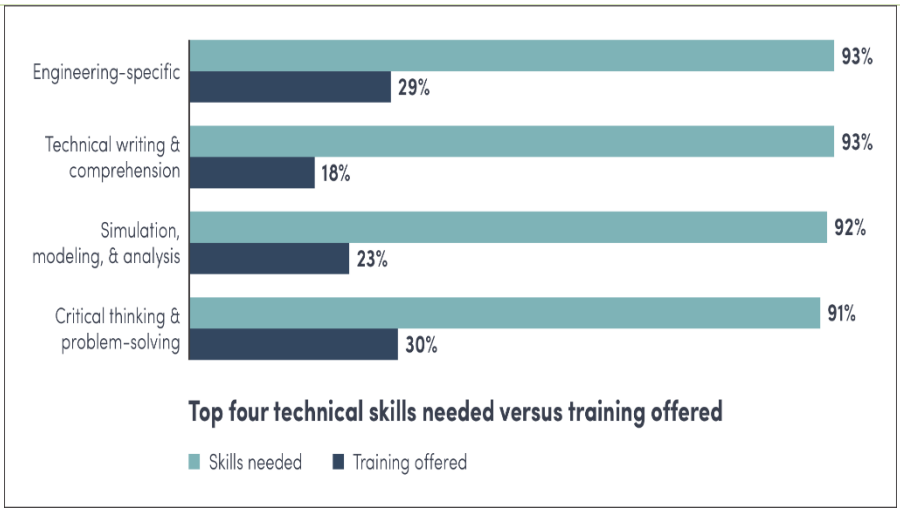

Figure 3. Technical Skill Demand vs. Training

Figure 3 shows the top four technical skills that Connecticut manufacturers considered the most important for their companies to remain competitive and the percentage of those companies offering in-house training to develop those skills. Although over 90% of employers endorse particular skills as important, 30% or fewer offer training. According to the CBIA report, "for the most part, manufacturers expect employees to arrive already trained" (p. 3). CCSU's BSEE is designed to provide a strong foundation in these highly valued skills.

- How does the program make use of the strengths of the institution (*e.g. curriculum, faculty, resources)* and of its distinctive character and/or location?

The proposed program leverages the existing strengths, infrastructure, and facilities planning of Central Connecticut State University and the School of Engineering, Science, and Technology. As the second largest public university in Connecticut and the largest within the CSCU System, the university has existing programs in mechanical and civil engineering. CCSU has been steadily increasing and specializing engineering programs, building on current faculty's expertise, both in industry and the classroom. The BSEE curriculum is designed to develop practicing engineers who are ready to serve in the diverse industries of Connecticut and New England.

Located in the center of Connecticut, CCSU attracts students from a larger geographic area and has easy access to manufacturing, scientific, and corporate industry. It is more convenient for CCSU programs to build partnership with those companies such as teaching, training, internship and employment.

The current facilities in Copernicus Hall will allow the program to begin enrollment in the 100- and 200-level courses required by this program. A new Engineering Building is expected within two years with additional lab and classroom space to accommodate a growing program (see details below). The existing and future facilities place emphasis on the learning of students rather than academic research, offering a contrast to facilities in larger research-focused institutions and allowing us to serve a distinct student population.

The BSEE program will be supported by existing university General Education programs and foundational science courses within nearly all STEM majors. BSEE related major courses are offered by the Engineering, Physics and Engineering Physics, Chemistry, and Mathematics departments.

- Equity (eliminating achievement disparities among different ethnic/racial, economic and gender groups) is one of the

Board of Regents' Goals. In addition to current institutional efforts already underway, what distinct actions will the proposed program undertake to advance equitable student success?

CCSU provides a welcoming environment for first-generation students, ensuring individual attention to both academic and career preparation. The complementary array of programs for professional careers ranging from engineering to technology enables seamless transfer within the School of Engineering, Science, and Technology. CCSU continues to emphasize and make strides towards improving retention, providing critical support for students of all backgrounds. A National Science Foundation study shows that although the overall share of bachelor's degrees earned by underrepresented minorities increased in science and engineering from 1995 to 2014, the increase was more in psychology, social, and computer science rather than engineering. Similarly, the number of women earning bachelor's degree in Engineering increased about 5,000, but mostly in chemical, materials, industrial and civil rather than in electrical, aerospace and mechanical. Because CCSU draws enrollment from urban cores of New Britain and Hartford, we are in a unique position to increase the percentage of electrical engineers who identify as underrepresented ethnic and racial minority.

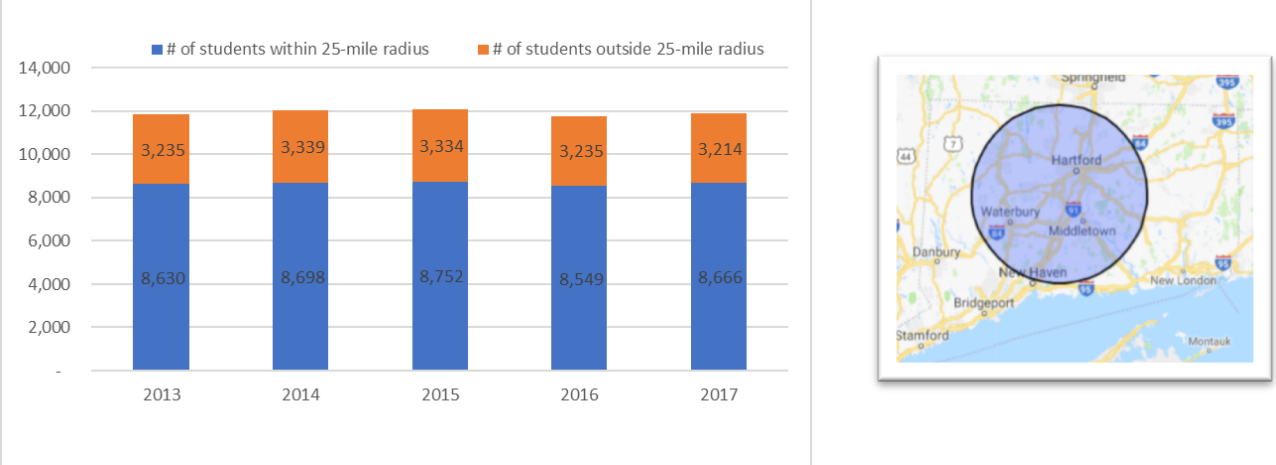

Figure 4. CCSU Fall Headcount Enrollment by Permanent Residence (25-mile radius)

CCSU provides access to current and prospective engineering students through its affordability and geographic accessibility. Public university tuition is a draw for many in-state families. The regional mission of the School of Engineering, Science, and Technology (SEST) serves the state and community, including a large number of commuters and non-traditional, part-time students. Data from CCSU's Office and Institutional Research and Assessment (OIRA) shows consistent increase in percentage of headcount enrollment for SEST undergraduate majors over the past decade (19.8% - 21.5%). Between 17.4% and 20.5% of our undergraduates are 25 and older. In addition, data on enrollment-by-town shows that over 70% of our total enrollment derives from students whose permanent residences are within 25 miles of campus, as shown in Figure 4.

In current drafts of CCSU's strategic plan, equity is a distinct strategic goal. Distinct actions to advance equitable student success will be developed in alignment with this strategic goal. Presently, CCSU operates multiple programs to help prepare pre-collegiate students in STEM-related disciplines and offers multiple opportunities for focused academic support for first-generation college students upon arrival at CCSU.

- Describe any transfer agreements with other CSCU institutions that will be instituted as a result of the approval of this

program *(Please highlight details in the Quality Assessment portion of this application, as appropriate)*

CCSU and CSCU are currently members of the College of Technology (COT) in the state of Connecticut. The COT provides pathways for students studying at the 12 CT community colleges or at Springfield Technical Community College in Massachusetts to complete a four-year degree at a number of public and private universities. CCSU currently has three pathway agreements for eligible students: Mechanical Engineering, Civil Engineering, and Technology Management. The proposed BSEE will be a natural extension to the CCSU-COT partnership.

The School of Engineering, Science, and Technology has been very active and supportive of the College of Technology pathway program since it began in 1995. The twelve site coordinators and the university coordinators meet every month to discuss new programs and update all changes in curriculum from participating institutions. The School of Engineering, Science, and Technology hosts an annual spring meeting and luncheon attended by all coordinators and advisors from the community colleges and participating universities. SEST department chairs highlight their programs and answer questions related to revisions and updates with the goal of maximizing the likelihood of a seamless transition across institutions.

The Engineering Science option offered at community technical colleges defines over 60 credits in sciences and general education, which are directly transferable to all engineering programs in the state. CCSU is one of the most active universities accepting most of the transfer students in all types of programs in Engineering, Engineering Technology, and Technology and Engineering Education in the State of Connecticut.

- Indicate what similar programs exist in other CSCU institutions, and how unnecessary duplication is being avoided

Six institutions in Connecticut currently offer a baccalaureate degree in Electrical Engineering: Fairfield University, the US Coast Guard Academy, the University of Connecticut, the University of Hartford, the University of New Haven, and Yale University. Of the six institutions in Connecticut offering a similar degree, only one—the University of Connecticut—overlaps with the constituent unit the BSEE will serve. According to the CBIA survey, CT employers in manufacturing hire graduates from major universities (University of Connecticut) and state universities (Central Connecticut State University) at comparable rates, as shown in Table 2, suggesting that CCSU graduates will be competitive in the CT workforce. The University of Connecticut serves an international audience and tailors its programs to that population; CCSU continues to focus on Connecticut and its workforce needs. As such, the BSEE serves a unique function within the CSCU system and State.

Table 2 summarizes the number of graduates from nationally accredited (by ABET) programs at Fairfield University, the US Coast Guard Academy, the University of Connecticut, the University of Hartford, the University of New Haven, and Yale University which grant a degree similar to the proposed BSEE. These institutions are located in Connecticut and represent both private and public universities and academies. While the total number of graduates continues to grow over the years surveyed, the number of graduates remains less than a tenth of the number of Electrical Engineers needed in Connecticut in 2018. To meet the identified 1,752 Electrical Engineers indicated by the CBIA, the total number of CT graduates would need to increase by a factor of 11. Given this level of need, a BSEE within the CSU system is warranted.

Table 2. EE Graduates by Program and by Year

Institution	Degree	2012	2013	2014	2015	2016	2017	2018
Fairfield University	Electrical Engineering, BS	9	6	10	5	10	11	6
US Coast Guard Academy	Electrical Engineering, BS	11	16	21	19	13	14	15
University of Connecticut	Electrical Engineering, BSE	34	43	55	53	58	73	65
University of Hartford	Electrical Engineering, BSEE	11	18	10	11	16	26	n/a
University of New Haven	Electrical Engineering, BS	7	10	13	21	22	16	28
Yale University	Electrical Engineering, BS	2	2	2	5	4	8	8
Total		74	95	111	114	123	148	

Cost Effectiveness and Availability of Adequate Resources

(Complete the PRO FORMA Budget – Resources and Expenditure Projections on page 6 and provide a narrative below regarding the cost effectiveness and availability of adequate resources for the proposed program. Add any annotations for the budget form below, as well.)

[i]Projected enrollments build in some attrition within cohorts. Credit hours per semester were estimated across cohorts based on the program's curriculum map.

[ii]Tuition revenues are based on AY 2019 in-state undergraduate rates and include tuition per semester ($2,962) plus the University General Fee less accident insurance ($1908). We assume that PT students will take 7 credits per semester, which would result in $3,815 of revenue ($545 per credit; $247 tuition, $298 General Fee per credit). No tuition increases for 2020-22 are assumed.

[iii]Although no new matriculations are expected in the Summer, it is possible that a limited number of summer courses will be offered eventually given adequate demand.

[iv]Students pay a $40 lab fee for each lab course with a maximum of $80 per semester (including Intersession and Summer). For each Fall and Spring semester, all FT undergraduates are expected to pay $80 in lab fees. PT students are estimated to pay $40 in lab fees each semester.

[v]Other revenue would include FT students in their sophomore year paying an additional $545 to take 19 credits in their Fall semester.

[vi]A program coordinator from the full-time faculty will receive one credit of reassigned time per Fall and Spring semester for managing the program. In FY20, the median salary of current faculty teaching within the program with 73.28% fringe is $176,950. Two credits of reassignment would cost $14,746. By the third year of the program, the coordinator may require a total of four reassigned load credits ($29,492).

[vii]Instructional costs scale with the number of credits expected to be offered according to the curriculum map. We assume that for the first cohort every course will run with a single section. For the second and third cohorts, anticipated enrollments would necessitate two sections per course. We estimated FT salary using the median FY20 salary of current faculty teaching with the program and 73.28% fringe. We estimated PT instruction as a Class C lecturer with 31% fringe. The instructional load increases dramatically as cohorts progress through the program. In Year 4 (which would reflect a steady state with all courses at all levels being offered), instructional expense is estimated to be $633,741.

[viii]An administrative professional is anticipated to spend approximately 10% of their time in direct support of the BS in Electrical Engineering. We included 45% fringe in this estimate and a 3% COLA for each year. In addition, a lab technician should be hired in Year 3 to ensure the effective functioning of laboratory instruments and equipment, especially within the new power and digital electronics lab. Starting salary is estimated at $55,000 with 45% fringe. In Year 2, a faculty member could receive 1 credit of reassigned time to set up and maintain lab equipment ($7,373).

[ix]Library resources include specialized journal subscriptions of approximately $7,500 per year.

[x]Replacement costs for equipment are covered by the lab fees collected as revenue. In the third year of the program, MATLAB extension software (i.e., Imagine Processing Toolbox, Simscape Power Systems, Simulink Design Optimization) will be purchased to support student learning. Total cost to implement the software with a classroom perpetual license will be approximately $4,000 (maintenance fees will be ongoing).

[xi]Other costs include a 3-year marketing plan of approximately $12,500 in Year 1, $10,000 in Year 2, and $7,500 in Year 3. Course development may also be supplemented through direct payment or release time of up to 6 credits per year. Estimated cost of direct payment at the Associate Professor level with 73.28% fringe is $21,688.

Student Recruitment / Student Engagement

What are the sources for the program's projected enrollments. Describe the marketing, advisement and other student recruitment activities to be undertaken to ensure the projected enrollments are achieved.

Based on the review of other Electrical Engineering programs enrollment headcounts in the state of Connecticut summarized in Table 3, we estimate first-year enrollment in Fall 2020 to be approximately 25 students. Enrollment is projected to increase steadily by 25 to 30 students per year within the first 4 years of the program. The first graduating class comprised of first-time full-time students is anticipated in 2024.

Table 3. EE Program Headcounts

Institution	2012	2013	2014	2015	2016	2017	2018
Fairfield University	23	21	20	27	27	31	
US Coast Guard Academy			77		74	83	83
University of Connecticut	178	212	206	230	247	267	288
University of Hartford	61	64	74	91	83	72	
University of New Haven	73	107	108	108	105	102	86
Yale University		9	15	16	18	20	

CCSU is in the process of developing multi-year marketing plans for new programs through the Office of Enrollment Management and Marketing and Communications. Marketing efforts include submitting a press release; advertising on radio, video, digital, and/or print platforms; and developing a program brochure, posters, and/or flyers.

Program faculty will attend Open House and other on-campus recruitment events to bolster enrollments of first-time full-time students. CCSU's strong relationship with the College of Technology (described above) will help establish feeder programs from community colleges into the BSEE.

The Office of Enrollment Management purchases the names of SAT and ACT test takers and develops communications plans to introduce them to the University. Admissions staff also spend a significant amount of time recruiting in the high schools and community colleges throughout the state and region. The Office of Enrollment Management will also be working with university and recruitment partners oversees to recruit international students into the program.

If applicable, what student engagement strategies will be employed to advance student retention and completion in program?

Institutionally, CCSU is actively examining multiple pathways to engage students with the goal of improving student persistence and degree completion.

SECTION 3: PROGRAM QUALITY ASSESSMENT

Learning Outcomes - L.O. *(Please list up to seven of the most important student learning outcomes for the program and concisely describe assessment methodologies to be used in measuring the outcomes. If the program will seek external accreditation or qualifies graduates to opt for a professional/occupational license, please frame outcomes in attention to such requirements. With as much detail as possible, please map these learning outcomes to courses listed under the "Curriculum" section of this application)*

EAC/ABET Accreditation

The BSEE program will seek national accreditation under ABET's General Criteria for Baccalaureate Level Programs defined by the Engineering Accreditation Commission (EAC). Assuming the program begins enrolling fist-year students in 2020, the first graduates of the proposed program would be in May 2024. Since ABET requires that a program has graduates prior to accreditation, the earliest we can apply for accreditation will be in the 2024-2025 ABET accreditation cycle. If transferred students graduate earlier than 2024, we may begin the accreditation process sooner.

The 2019-2020 ABET Engineering Programs General Criteria are listed below and followed by a brief description of how the proposed BSEE will meet the given criteria:

ABET General Criteria	Satisfied By:
Students	Student performance and progress will be monitored and documented regularly. Entrance criteria and graduation requirements necessary for accreditation are clearly stated in this proposal.
Program Educational Objectives	The PEOs are clearly stated in this proposal and are aligned with the mission of the university. PEOs will be reviewed periodically.
Student Outcomes	Student outcomes are clearly stated below and align with ABETs criteria for accreditation.
Continuous Improvement	The program will regularly use appropriate, documented processes for assessing and evaluating student outcomes. Results of the assessment will be reviewed by all faculty teaching in the program as well as with members of industry.
Curriculum	The curriculum provides adequate preparation in support of the student outcomes and program educational objectives. The curriculum aligns with the four area specified by ABET including: 1. College-level mathematics and basic sciences with experimental experience 2. Courses in Engineering, Computer Sciences, and Engineering Design al using modern engineering methods and tools 3. A broad educational component that complements the technical content. 4. A culminating major engineering design experience that incorporates engineering standards, multiple constraints, and is based on prior course work
Faculty	Current members have a variety of backgrounds that cover key areas of the proposed curriculum. Future hires and adjunct faculty will be held to a similar standard in order to serve the students enrolled in the program. A

	sufficient number of faculty will be maintained to ensure adequate levels of interaction with students and industrial/professional members of the engineering community.
Facilities	Classrooms and laboratories will be equipped with adequate tools to ensure students are prepared to be practical engineers upon completion of the program. The current library and computing services serve to meet this criterium.
Institutional Support	University leadership fully supports the Electrical Engineering program as evidenced by the support of this proposed program.

BSEE Student Outcomes

The BSEE's learning outcomes align with its Program Educational Objectives and the ABET accreditation criterion on Student Outcomes.

BSEE Program Educational Objectives (PEO): Within a few years of graduation, graduates of the Electrical Engineering Program are expected to:

1. demonstrate proficiency in the professional practice of engineering as members of multidisciplinary teams.
2. demonstrate intellectual or professional growth as evidenced by post-graduate education, licensing, certificate, promotion, and participation in pertinent professional societies.
3. understand the responsibility an engineer bears to society and are characterized by high standards of ethics and professionalism.

EAC/ABET Student Outcomes: By the time of graduation, students are expected to attain:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an 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. an ability to communicate effectively with a range of audiences
4. an 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. an 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. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Program Administration *(Describe qualifications and assigned FTE load of administrator/faculty member responsible for the day-to-day operations of the proposed academic program. Identify individual for this role by name or provide time frame for prospective hiring)*

The Electrical Engineering Program will be housed within the Computer Electronics & Graphics Technology

Department. A temporary program coordinator (full-time tenured or tenure-track faculty member) will be selected and receive one credit of reassigned time per semester for managing the program (see attached pro forma budget). A new program coordinator will be selected after new faculty members are hired for the BSEE (see below).

Faculty *(Please complete the faculty template provided below to include current full-time members of the faculty who will be teaching in this program and, as applicable, any anticipated new positions/hires during the first three years of the program and their qualifications)*

How many new full-time faculty members, if any, will need to be hired for this program?

One full-time faculty member will be needed by Year 2 of the program. In Year 3, another full-time faculty member will be needed. If enrollments exceed projection by 10% in Year 3, a third full-time faculty member would be needed.

What percentage of the credits in the program will they teach? **By Year 4: 75%**

What percent of credits in the program will be taught by adjunct faculty? **By Year 4: 25%**

Describe the minimal qualifications of adjunct faculty, if any, who will teach in the program **Master of Science in Electrical Engineering or Master of Science in a related engineering field with comparable experience.**

Special Resources *(Provide a brief description of resources that would be needed specifically for this program and how they will be used, e.g. laboratory equipment, specialized library collections, etc. Please include these resources in the Resources and Expenditures Projections spreadsheet)*

The EE program must have at least two new teaching/laboratory spaces by the second year of the program. CCSU has broken ground on a new Engineering Building, which is expected to open in 2021. Table 4 shows that within the new building, the following laboratories will be available:

Table 4. New Electrical Engineering Laboratories

Laboratory and Description	**Sets of Equipment**	**Unit Price**	**Cost**
Laboratory of Power Engineering: Power Generation, Power Transmission and Distribution, Protection Techniques, Energy Utilization and Efficiency	2	$415,000.00	$830,000.00
Laboratory of Renewable Energies: Photovoltaic, Wind, Solar Thermal, Solar Energy Collector, Fuel Cells	1	$550,000.00	$550,000.00
Laboratory of Electric Machines and Motors: Dissectible Machines, DC Motor Control Trainer, Synchronous Machines, Single and Three Phase Transformers, and Motor Speed Control	6	$58,400.00	$350,400.00
Laboratory of Energy Storage Systems: The Energy Storage Systems Technologies – Mechanical, Electrochemical, Chemical, Electrical and Thermal. Energy Storage Effectively Stabilizes the Electric Grid, Categories of Commercial Scale Batteries, Rechargeable Batteries, The Role of Hydropower Generation, The Thermal Power Plants. The Energy Storage Technologies - Generation Responses by Technology.	1	$180,000.00	$180,000.00

Laboratory of Electric Circuits and Digital Electronics: Electronic test equipment, Digital Multimeters, Power Supplies, Function Generators, Oscilloscopes, Spectrum Analyzers, Network Analyzers, Logic Analyzers	2	$580,000.00	$1,160,000.00
Total Cost of Electrical Engineering Laboratories			**$3,070,400.00**

Costs include capital outlay for equipment.

Major library resources include print and/or online digital library access to Electrical and Electronic Engineering journals, magazines, transactions, and conference proceedings. Major publishers include IEEE, Springer, and Elsevier. Such resources are valuable for teaching and research of the BSEE program. The typical price of a single such publication ranges from $600 to $3,000 per year.

Curriculum

*(Please list courses for the proposed program, including the core/major area of specialization, prerequisites, electives, required general education courses (undergraduate programs), etc. Using numerals, map the Learning Outcomes listed in the previous section to relevant program courses in this table. Mark any new courses with an asterisk * and attach course descriptions. Mark any courses that are delivered fully online with a double asterisk ** Please modify this format as needed)*

Course Number and Name	P.E.O. # [1]	S.O. # [2]	Pre-Requisite	Cr Hrs	Course Number and Name	P.E.O. # [8]	S.O. # [9]	Cr Hrs
Program Core Courses					**Other Related/Special Requirements***			
EE 101 (L) – Electric Circuits I*	1	1, 5	Math 152; Phys 125 (concur)	3	ENGR 150 – Intro to Engineering	1,3	1, 3, 4, 5	3
EE 201 (L) – Electric Circuits II*	1	1, 6, 7	EE 201	3	ENGR 240 – Computations Meth for Engineers (Preq: MATH 152, WRT 105/110)	1	1, 2, 7	3
EE 212 (L) – Fund. Of Logic Design*	1	1, 2	Engr 240	3	CHEM 161 – General Chemistry	1	1, 7	3
EE 301 – Signals & Systems*	1	1, 7	EE 201. Math 221, Phys 126	3	CHEM 162 – Gen Chemistry Lab	1	1, 6	1
EE 331 (L) – Intro to Semiconductors*	1	1, 6	EE 201	3	MATH 222 – Calc III	1	1, 7	4
EE 312 - Computer Systems*	1	1, 2	EE 212	3	MATH 226 – Linear Algebra & Prob for Engrs	1	1, 7	4
EE 313 (L) – Electric Energy Eng. I*	1,3	1, 6	Math 222, Engr 240	3	MATH 355 – Intro Differential Equations w/Appl.	1	1, 7	4
EE 323 (L) – Electric Energy Eng. II*	1,3	2, 6	EE 313	3				
EE324 (L) – Control Systems I*	1-3	1, 2	EE 301	3				
EE 330 – Electromagnetics*	1,2	1, 7	Math 222	3				
EE 333 (L) - Electric Machines & Motors I*	1,2	1, 6	EE 201	3				
EE 343 (L) - Electric Machines & Motors II*	1,2	2, 6	EE 333	3				
EE 351 (L) – Analog Circuits Design*	1,2	1, 6	EE 331	3				
EE 352 (L) – Signal Processing & Pattern Analysis*	1-3	1, 7	Math 226, Engr 240	3				
EE 353 (L) – Energy Storage System*	1-3	1, 2, 4	EE323	3				
EE 363 (L) – Renewable Energy I*	3	1, 2, 4	EE 323	3				
EE 401 – Random Signals &	1,2	1, 7	EE 301,	3				

[1] From the Program Learning Outcomes enumerated list provided at the beginning of Section 3 of this application
[2] From the Learning Outcomes enumerated list provided at the beginning of Section 3 of this application

Systems*			Math 226					
EE 424 (L) – Controls Systems II*	1-3	2, 6	EE 324	3				
EE 430 (L) – RF Communications*	1,2	1, 7	EE 330	3				
EE 497 – Capstone Project I*	1-3	2, 3, 5, 7	EE 343, EE 430	2				
EE 498 – Capstone Project II*	1-3	2, 3, 4, 5	EE 498	2				
	Core Course Prerequisites				**Elective Courses in the Field**			
	PHYS 125 – University Physics I (SA IV)			4				
	PHYS 126 – University Physics II (SA IV)			4				
	WRT 105 or WRT 110 – (SK I)			3				
	ENGR 290 – (SK I)			3				
	MATH 152 – Calc I (SK II)			4				
	MATH 221 – Calc II (SK II)			4				
	Total Other Credits Required to Issue Credential *(e.g. GenEd/Liberal Arts Core/Liberal Ed Program)*					20		

SA I – 6 credits: Literature (recommend ENG 203 or ENG 204), PHIL 144
SA II – 6 credits: History (recommend international), ECON 200 or ECON 201
SA III – 6 credits:
SA IV: requirements stated above
SK I: requirements stated above
SK II: : requirements stated above
SK III: Foreign Language (refer to catalog)
SK IV: PE 144 (refer to the catalog for transfer students with over 15 credits)

***Special Requirements** include co-curriculum activities – structured learning activities that complement the formal curriculum – such as internships, innovation activities and community involvement.

NOTE: The PRO FORMA Budget on the last page should provide reasonable assurance that the proposed program can be established and is sustainable. Some assumptions and/or formulaic methodology may be used and annotated in the "Cost Effectiveness …" narrative on page 2.

CONNECTICUT BOARD OF REGENTS FOR HIGHER EDUCATION
Connecticut State Colleges & Universities
*APPLICATION FOR **NEW PROGRAM APPROVAL***

Central Connecticut State University

1615 Stanley Street
New Britain, Connecticut 06050-4010
School of Engineering, Science and Technology

Department of
Computer, Electronics & Graphics Technology

Effective:

Name/ID:

Address:

BS Electrical Engineering

General Education

Study Area I -*Arts and Humanities (6)*

	Literature (Eng 203/204 recommended)	3
	PHIL 144	3

Study Area II - *Social Sciences (6)*

	History (Int recommended)	3
	ECON 200 or ECON 201	3

Study Area III - *Behavioral Sciences (6)*

		3
		3

Study Area IV - *Natural Scientific (8)*

	PHYS 125 - Univ Physics I	4
	PHYS 126 - Univ Physics II	4

Skill Area I - *Communication Skills (6)*

	WRT 105 or WRT 110	3
	ENGR 290 - Eng. Tech Writing & Pres.	3

Skill Area II - *Mathematical (8)*

	MATH 152 Calc I	4
	MATH 221 Calc II	4

Skill Area III - *Foreign Language*

	3 sequential years of one foreign language at the high school level
	passed the foreign language exam.
	Completed 112 or 114 foreign language courses
	completed above 112 or 114 foreign language course
	demonstration of native proficiency in a language other than English

Skill Area IV - *Univ. Requirements (2-3)*

	PE 144 Fitness/ Wellness	2

Total General Education 42

		Major Requirements		**Fall**	**Sp**
	EE 101	Electric Circuits I	3		
	EE 201	Electric Circuits II	3		
	EE 212	Fundamentals of Logic Design	3		
	EE 301	Signals and Systems	3		
	EE 312	Computer Systems	3		
	EE 313	Electric Energy Engineering I	3		
	EE 323	Electric Energy Engineering II	3		
	EE 324	Control Systems I	3		
	EE 330	Electromagnetics	3		
	EE 331	Intro. to Semiconductors	3		
	EE 333	Electric Machines & Motors I	3		
	EE 343	Electric Machines & Motors II	3		
	EE 351	Analog Circuits Design	3		
	EE352	Signal Processing & Pattern Analysis	3		
	EE 353	Energy Storage System	3		
	EE 363	Renewable Energy I	3		
	EE 401	Random Signals & Systems	3		
	EE 424	Control Systems II	3		
	EE 430	RF Communications	3		
	EE 497	Capstone Project I	2	x	x
	EE 498	Capstone Project II	2	x	x
			61		
		Related Major Requirements			
	ENGR 150	Intro. to Engineering	3		
	ENGR 240	Computational Methods for Engrs.	3		
	CHEM 161	General Chemistry	3		
	CHEM 162	General Chemistry Lab	1		
	MATH 222	Calculus III	4		
	MATH 226	Linear Algebra and Prob for Engrs.	4		
	MATH 355	Intro. Differential Equations w/ Appl.	4		
			22		

TOTAL CREDITS 125

Bachelor of Science in Electrical Engineering

FRESHMAN		SOPHMORE		JUNIOR		SENIOR	
Fall Semester	*Spring Semester*	*Fall Semester*	*Spring Semester*	*Fall Semester*	*Spring Semester*	*Fall Semester*	*Spring Semester*
4 MATH 152 Calculus I	4 Math 221 (Math 152) Calculus II	4 MATH 222 Calculus III (Math 221)	4 MATH 355 (Math 222) Differential Eq.	3 SA-I Literature (I)	3 SA-2 History (I)	3 EE 401(LL-4) Random Signals & Systems (EE 301 / MATH 226)	3 EE 430 (LL-5) RF Communications (EE 330/EE 351/EE401)
	3 ENGR 290 (WRT 105 or 110) Eng. Tech Writing	4 MATH 226 Lin.Algeb. & Prob. (MATH 221)	3 SA-1 Philosophy	3 EE 301 (L-3) Signals and Systems (EE 201/ MATH 355)	3 EE 324 (LL-4) Control Systems I (EE 301)	3 EE 424 (LL-4) Control Systems II (EE 312/EE 324)	(Optional Elective to retain full-time status)
3 ENGR 150 Intro. To Engineering	3 ENGR 240 (ENGR150/MATH152) Computational Method.	3 EE 212 (LL-5) Fund. of Logic Design (ENGR 240)	3 EE 312 (LL-4) Computer Systems (EE 212)	3 EE 330 (L-3) Electromagnetics (EE 201/Math 222/Math 226)	3 SA-3 elective	3 EE 333 (L-3) Electric Machines & Motors I (EE 330)	3 EE 343 (L-3) Electric Machines & Motors II (EE 333)
3 SA-3 elective	3 EE 101 (LL-5) (Math 152; Phy125 concur.) Electric Circuits I	4 CHEM 161 / Chem 162 Gen. Chemistry & Lab	3 EE 201 (LL-5) Electric Circuits II (EE 101, Math 355, co req)	3 EE 313 (LL-5) Electric Energy Engr. I (EE 201 / MATH 221)	3 EE 323 (LL-5) Electric Energy Engr. II (EE313)	3 EE 363 (L-3) Renewable Energy I (EE 323)	3 EE 353 (L-3) Energy Storage System (EE323)
2 PE 144 (skill IV)	4 PHYS 125 (Math 152)	4 PHYS 126 (Phys 125)	3 SA-2 ECON 200 or 201 ET 399 (change to ENGR)	3 EE 331 (LL-4)) Intro. to Semiconductors (EE 201)	3 EE 351 (LL-4) Analog Circuits Design (EE 331)	3 EE 352 (LL-5) Signal Processing & Pattern Analysis (MATH226/E301)	
3 **Skill Area I WRT 105 or 110**						2 EE 497 Capstone-I (EE 324 or EE 323 or EE 351; and 18 credits at CCSU in the Major)	2 EE 498 Capstone-II (EE 497)
CREDITS BY TERM							
15	17	19	16	15	15	17	11

EE Course Descriptions (approved by Curriculum and Senate)

EE 101 - Electric Circuits I - Basic concepts and laws, methods of analysis and circuit theorems in DC and transient circuits. Topics include voltage, current, power, resistance, capacitance, inductance, node analysis, mesh analysis, Thevenin's theorem, Norton's theorem, steady state and transient analysis. Laboratory experiments involve building circuits, using instruments to measure quantities and observe phenomena. Two hours lecture and three hours laboratory. Prerequisite(s): MATH 152 (Calc II), PHYS 125 concurrently (Phys I)

EE 201 - Electric Circuits II - Frequency response, gain and phase shift, Bode plots, resonance. Two-port circuit characterization. Phasor and Laplace Transforms in analysis of linear circuits with and without initial conditions. Low- and high-pass filter design. Determining frequency response by analysis of poles and zeroes in the complex plane. Two hours lecture and three hours laboratory. Prerequisite(s): EE 101 (Electric Circuits I) and MATH 355 concurrently (Differential Equations)

EE 212 - Fundamentals of Logic Design - Principles and applications of digital circuits, number systems, Boolean algebra, combinatorial and sequential logic circuits, and arithmetic circuits. Laboratory experiments focus on circuit building and troubleshooting using TTL integrated circuits. CAD tools for design, simulation and testing of digital designs. Three hours lecture and two hours laboratory. Prerequisite(s): ENGR 240 (Computational Methods for Engineering)

EE 301 - Signals and Systems - Study of linear systems using differential equations: impulse and step response with convolution, Fourier series and transforms, and Laplace transforms for discrete time and continuous time signals. Emphasis on modeling of systems and description of the transient and steady state responses. Three hours lecture. Prerequisite(s): EE 201 (Electric Circuits II) and MATH 355 (Differential Equations)

EE 312 - Computer Systems - Computer hardware and software components, memory-addressing modes, development of assembly language programs, programming involving input/output ports and interrupts. Two hours lecture and two hours laboratory. Prerequisite(s): EE 212 (Fundamental of Logic Design)

EE 313 - Electric Energy Engineering I - Review of electric utility industry. Study of energy engineering which includes symmetrical three-phase systems, the three-phase synchronous generator, the power transforms, transmission lines, energy system in its normal states - power-flow analysis. Prerequisite(s): EE201 (Electric Circuits II), MATH221 (Calculus II)

EE 323 - Electric Energy Engineering II - Optimum operating strategies, the energy system in steady state - the control problems, the energy system transients - surge phenomena and symmetrical fault analysis, unbalanced system analysis, emergency control. Prerequisite(s): EE313 (Electric Energy Engineering I)

EE 324 - Control Systems I - Study of continuous transfer function models, signal norms, basic feedback loop, stability and tracking. Root locus analysis and design, phase and gain margin analysis and design. Two hours lecture and two hours laboratory. Prerequisite(s): EE 301 (Signal and Systems)

EE 330 – Electromagnetics - Study of electric and magnetic fields are studied using vector algebra. Development of Maxwell's Equations. Study of transmission lines. Three hours lecture. Prerequisite(s): EE 201 (Electric Circuits II) and MATH 222 (Calc III) and MATH 226 (Linear Algebra & Probability)

EE 331 - Introduction to Semiconductors - Study of electrical conduction in solid-state materials. Analysis and design of switching circuits containing diodes and transistors. Analysis and design of combinational logic on the transistor level through the layout and advantages of CMOS circuits. Two hours lecture and two hours laboratory. Prerequisite(s): EE 201 (Electric Circuits II)

EE 333 - Electric Machines and Motors I - Introduction to magnetic systems: Equivalent circuits, magnetism, energy, losses, and magnetic flux. Ideal transformers, equivalent circuit for two-winding transformer, coupled-circuit representation, transformer performance, transients, and variable frequency operation. Basic principles of electric machines, electromechanical energy conversion, cylindrical machines, constant torque conditions, polyphase alternating current machines, construction of electromagnetic machinery. Three hours lecture. Prerequisite(s): EE330 (Electromagnetics)

EE 343 - Electric Machines and Motors II - Direct -current machines, magnetic systems for dc machines, windings, excitation, equivalent circuit, general equations, generator performance, motor performance, permanent magnet motors. Induction machines, AC windings, three-phase induction machines, approximate equivalent circuit. Synchronous machines, three-phase synchronous machines, steady-state operation, power factor, determination of equivalent circuit parameters. Three hours lecture. Prerequisite(s): EE 333 (Electrics Machines and Motors I)

EE 351 - Analog Circuit Design - Analysis and design of single-transistor amplifiers, multiple-transistor amplifiers, and operational amplifiers. Emphasis is placed on the simulation of amplifiers on the transistor level using industry-standard software. Two hours lecture and two hours laboratory. Prerequisite(s): EE 331 (Introduction to Semiconductors)

EE 352 - Signal Processing & Pattern Analysis – Study of signal-processing techniques including data sampling, discrete-time filtering, spectral analysis, and convolution. Introduction to pattern analysis for description, recognition, and prediction of sensor signals. Applications of the techniques include sensor-based monitoring of diverse electrical systems. Prerequisite(s): MATH226 (Linear Algebra & Probabilities), EE301 (Signals & Systems)

EE 353 - Energy Storage Systems - Energy storage effectively stabilizes the Electric Grid. Mechanical, Electrochemical, Chemical, Electrical and Thermal energy storage systems. Categories of commercial-grade batteries, rechargeable batteries. The role of hydropower generation. The thermal power plants. Energy storage technologies - Generation responses by technology. Three hours lecture. Prerequisite(s): EE 323 (Electric Energy Engineering II) and CHEM 161 (General Chemistry) and CHEM 162 (General Chemistry Laboratory)

EE 363 - Renewable Energy - Wind energy, hydroelectric power plants, solar power plants, geothermal power generation, Biofuel, Wave-motion power plants, promoting renewable energy. Three hours lecture. Prerequisite(s): EE 323 (Electric Energy Engineering II)

EE 424 - Control Systems II - Study of controlling systems, both analog and digital, with digital controllers. Students will learn about the practical implementation of modern control systems. Students will study topics such as digital PID, lead-lag, deadbeat, and inverse control. A variety of controllers will be implemented using computer systems. Prerequisite(s): EE 312 (Computer Systems) and EE 324 (Control Systems I)

EE 430 - RF Communications - Study of encoding information using various modulation methods. Examples include amplitude, frequency, and phase modulation. Introduction of information rate and analysis of noise in communication systems. Two hours lecture and three hours laboratory. Prerequisite(s): EE 330 (Electromagnetics) and EE 401 (Random Signals and Systems) and EE 351 (Analog Circuit Design)

EE 497 - Capstone I - Identification, investigation, research, and proposal of problem. Social, environmental, ethical, economic, and legal factors are considered. A detailed concept and design proposal is presented. Students perform preliminary design, submit documented design, and present at a formal preliminary design review. Two hours lecture. Prerequisite(s): EE 323 (Electric Energy Engineering II) or EE 324 (Control Systems I) or EE 351 (Analog Circuit Design)

EE 498 - Capstone II - Second course in capstone design sequence. Student design teams finalize capstone projects. Final design analysis must satisfy project objectives written in previous course and show sound engineering judgment. A functional prototype is simulated, built, and evaluated. A final report is presented and the project demonstrated. Two hours lecture. Prerequisite(s): EE 497 (Capstone I)

Program Outline *(Please provide a summary of program requirements including total number of credits for the degree, special admission requirements, capstone or special project requirements, etc. Indicate any requirements and arrangements for clinical affiliations, internships, and practical or work experience.)*

- **Program Requirements**
  - The BS in Electrical Engineering requires 42 general education credits, 61 credits in major-related courses, and 22 credits in major-related courses that extend students' preparation in mathematics and the fundamental sciences.
  - The program totals 125 credits to satisfy the mathematically-intensive standards for ABET accreditation. All five required Mathematics courses in the curriculum (Calculus I, II, and III; Linear Algebra and Probability for Engineers; and Introduction to Differential Equations with Applications) are 4-credit courses at CCSU. Please see the attached approved exception to the 120-credit normalization policy for this program.

- **Students must be ready to enroll in Calculus I (MATH 152). This requirement can be met by any of the following:**
  - Earning both a Scholastic Aptitude Test (SAT) Mathematics score of 620 or higher and a grade of B or better in a two-semester high school pre-calculus or calculus course.
  - Earning a score of 3 or better on the Calculus AB or Calculus BC Advancement Placement exam.
  - Earning a sufficiently high score on CCSU's Mathematics Placement Exam
  - Credit transfer from an accredited two-year of four-year higher education institution of a Pre-Calculus course and a Trigonometry course with grades of C- or higher, or a combined Trigonometry/Pre-calculus course with a grade of C- or higher, or a Calculus course with a grade of C- or higher. (subject to equivalency evaluation of the courses).
  - CT Community College students who successfully complete the full "Engineering Science" program and earn their Associates Degree will be automatically admitted to the Electrical Engineering program.
- **Capstone Project**
  - The proposed program includes a culminating capstone project in accordance with ABET criteria. The student projects will include a major engineering design experience incorporating engineering standards, multiple design constraints, and earlier coursework.

Full-Time Faculty Teaching in this Program *(Note: If you anticipate hiring new faculty members for this program you may list "to be hired" under name and title. Provide required credentials, experience, and other responsibilities for each new position anticipated over the first three years of implementation of the program)*

Faculty Name and Title	Institution of Highest Degree	Area of Specialization/Pertinent Experience	Other Administrative or Teaching Responsibilities
Karen Tracey	UMASS-Amherst, EdD	Computer Application & Integration	
Shuju Wu	University of Pittsburgh, PhD	Telecommunications	Department Chair
David Broderick	Auburn University, PhD	Embedded Systems, Electronics, Control Systems	
Sangho Park	University of Texas at Austin, PhD	Electrical and Computer Engineering	
Deborah Zanella	Nova Southeastern University, EdD North Carolina State University, MS	Higher Education Electrical Engineering	
To be hired	PhD	Electrical and Electronics Engineering/Power, Energy	Program Coordinator
To be hired	PhD	Electrical and Electronics Engineering/Power, Energy	

CONNECTICUT BOARD OF REGENTS FOR HIGHER EDUCATION
Connecticut State Colleges & Universities
*APPLICATION FOR **NEW PROGRAM APPROVAL***
PRO FORMA Budget - Resources and Expenditures Projections (whole dollars only)

PROJECTED Enrollment[i]	2020-21						2021-22						2022-23					
	Fall Semester		Spring Semester		Summer		Fall Semester		Spring Semester		Summer		Fall Semester		Spring Semester		Summer	
	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT
Internal Transfer (from other programs	2	0	0	0	0	0	3	0	0	0	0	0	4	0	0	0	0	0
New Students (first time matriculating)	25	2	0	0	0	0	26	3	0	0	0	0	28	5	1	0	0	0
Continuing Students progressing to credential	0	0	27	2	0	0	21	2	48	5	0	0	44	5	73	10	0	0
Headcount Enrollment	27	2	27	2	0	0	50	5	48	5	0	0	76	10	74	10	0	0
Total Estimated FTE per Year[1]	27.7		31.3		0.0		57.3		54.7		0.0		86.5		83.0		0.0	
PROJECTED Program Revenue	2020-21						2021-22						2022-23					
	Fall Semester		Spring Semester		Summer[iii]		Fall Semester		Spring Semester		Summer[iii]		Fall Semester		Spring Semester		Summer[iii]	
	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT
Tuition[2] [ii]	$121,750	$7,746	$131,490	$7,746	$0	$0	$228,890	$19,365	$233,760	$19,365	$0	$0	$350,640	$38,730	$360,380	$38,730	$0	$0
Tuition from Internal Transfer[2]	$9,740	$0	$0	$0			$14,610	$0	$0	$0			$19,480	$0	$0	$0		
Program Specific Fees (lab fees, etc.)[iv]	$2,160	$80	$2,160	$80	$0	$0	$4,000	$200	$3,840	$200	$0	$0	$6,080	$400	$5,920	$400	$0	$0
Other Revenue (annotate in narrative)[v]	$121,750	$7,746	$131,490	$7,746	$0	$0	$11,445						$13,625					
Total Annual Program Revenue	**$282,952**						**$535,675**						**$834,835**					

PROJECTED Program Expenditures[3]	2020-21	2021-22	2022-23
Administration (Chair or Coordinator)[4] [vi]	$14,746	$14,746	$29,492
Faculty (Full-time, total for program) [4] [vii]	$22,119	$110,594	$284,866
Faculty (Part-time, total for program) [4] [vii]	$0	$0	$63,678
Support Staff (lab or grad assist, tutor) [viii]	$8,235	$15,855	$88,486
Library Resources Program [ix]	$7,500	$7,500	$7,500
Equipment (List in narrative) [x]	$4,480	$8,240	$16,800
Other[5] [xi]	$33,902	$31,688	$29,188
Estimated Indirect Costs[6]			
Total Expenditures per Year	**$90,982**	**$188,622**	**$520,010**

NOTE: Existing regulations require that: "an application for a new program shall include a complete and realistic plan for implementing and financing the proposed program during the first cycle of operation, based on projected enrollment levels; the nature and extent of instructional services required; the availability of existing resources to support the program; additional resource requirements; and projected sources of funding. If resources to operate a program are to be provided totally or in part through reallocation of existing resources, the institution shall identify the resources to be employed and explain how existing programs will be affected. Reallocation of resources to meet new and changing needs is encouraged, provided such reallocation does not reduce the quality of continuing programs below acceptable levels."

1 1 FTE = **15** credit hours for undergraduate programs; 1 FTE = 12 credit hours for graduate programs; both for Fall & Spring
Formula for conversion of part-time enrollments to Full-Time Equivalent (FTE): Divide part-time enrollment by 3, and round to the nearest tenth - for example 20 t-time enrollees equals 20 divided by 3 equals 6.67 or 6.7 FTE.

2 Revenues from all courses students will be taking.

3 Capital outlay costs, instructional spending for research and services, etc. can be excluded.

4 If full-time person is solely hired for this program, use rate time; otherwise, use a percentage. Indicate if new hires or existing faculty/staff. Record Salary and Fringe Benefits, accordingly.

5 e.g. student services. Course development would be direct payment or release time; marketing is cost of marketing that program separately.

6 Check with your Business Office – community colleges have one rate; the others each have their own. Indirect Cost might include such expenses as student services, operations and maintenance.