# Abilene Approval Chart for Curriculum Changes

A = Approve  I = Information Item  R = Respond in Writing

Course Number _____ or Degree Plan(s) B.S. in Electrical Engineering

State the requested change and reason. A memo may be attached if more space is necessary.

The Electrical Engineering major is a natural outgrowth of the existing Electrical Concentration of the current Engineering degree. The additional specificity will aid students in obtaining jobs while simultaneously helping recruiting efforts to grow our student body.

Indicate the requested change.

| | **Change to a Course** | **Dept./School[1]** | **College** | **Dean** | **TEC** | **UGEC** | **AUAC/Grad** | **Provost** | **President** |
|---|---|---|---|---|---|---|---|---|---|
| 1. | Title (description unchanged) | A | A | A | I | – | I | I | I |
| 2. | Description (not affecting content) | A | A | A | I | – | I | I | I |
| 3. | Course term(s) | A | I | A | I | – | I | I | I |
| 4. | Content (change of course outcomes) | A | A | A | I | – | I | A | I |
| 5. | Number of hours (lecture, lab, contact) | A | A | A | A | – | A | A | I |
| 6. | Course number within the hundred | A | A | I | I | – | I | I | I |
| 7. | Course number beyond the hundred | A | A | A | A | – | A | A | I |
| 8. | Prerequisites | A | A | A | I | – | I | I | I |
| 9. | Course fee(s) | A | – | A | – | – | – | A | I |
| 10. | From U to G *or* G to U | A | A | A | A | – | A | A | I |
| 11. | Cross-list course | A | A | A | A | – | A | A | I |
| 12. | Department of record | A | A | A | A | – | A | A | I |
| 13. | Close a course | A | A | A | A | – | A | A | I |
| 14. | New course (includes combining or splitting courses) | A | A | A | A | – | A | A | I |

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| | Change to the University Requirements (All Campuses) | Dept./School[1] | College | Dean | TEC | UGEC | AUAC/Grad | Provost | Faculty | President | Trustees |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | University Requirements — Change course outcomes of an included course[2] | A | A | A | – | A | – | A | – | A | – |
| 2. | University Requirements — Add or drop a required course from the University Requirements[2] | A | A | A | – | A | – | A | A | A | – |
| 3. | University Requirements — Add or drop a course from a menu within the University Requirements[2] | A | – | – | – | A | – | A | – | A | – |
| 4. | University Requirements — Change hours within a menu in the University Requirements[2] | A | A | A | – | A | – | A | A | A | – |
| | **Change to Catalog Information (for Campus)** | | | | | | | | | | |
| 1. | General Requirements for Bachelor's Degrees and Associate's Degrees | – | – | – | – | – | A | A | A | A | – |
| 2. | Policies governing academic probation and suspension | – | – | – | – | – | A | A | A | A | – |
| 3. | Requirements for graduating with honors | – | – | – | – | – | A | A | A | A | – |
| | **Change to a Degree Plan Proposed by Faculty or College** | | | | | | | | | | |
| 5. | Educational Program — Revise[3] | A | A | A | A | – | A | A | – | A | – |
| 6. | Educational Program — Adopt/change admission requirements | A | A | A | A | – | A | A | – | A | – |
| 7. | Educational Program — Add[3] | A | A | A | A | – | A | A | A | A | I |
| 8. | Educational Program — Discontinue | A | A | A | A | – | A | A | A | A | I |
| 9. | GPA — Revise program-required GPAs | A | A | A | A | – | A | A | – | A | – |
| 10. | Minor — Revise | A | A | A | I | – | I | I | – | I | – |
| 11. | Minor — Add | A | A | A | A | – | A | A | – | A | – |
| 12. | Minor — Discontinue | A | A | A | A | – | A | A | – | A | – |
| 13. | Degree — Add | A | A | A | A | – | A | A | A | A | I |
| 14. | Degree — Discontinue | A | A | A | A | – | A | A | A | A | I |
| | **Change to a Degree Plan Proposed By Provost** | | | | | | | | | | |
| 15. | Educational Program — Discontinue | R | – | R | A | – | A | A | A | A | I |
| 16. | Minor — Discontinue | R | – | R | A | – | A | A | – | A | – |
| 17. | Degree — Discontinue | R | – | R | A | – | A | A | A | A | I |

[1] When an academic unit does not have a council, the UGEC and/or UUAC will serve as its academic council, depending on the nature of the issue.

[2] Courses that satisfy ACU's University Requirements will normally have lower-level numbering, be free of prerequisites and co-requisites, appeal to more than one or two majors, and "not narrowly focus on those skills, techniques, and procedures specific to a particular occupation or profession" (SACS 2.7.3). Departments may request exceptions to the first three criteria.

[3] For undergraduate majors, a minimum of 30 hours is required. These programs must have a minimum of 6 elective hours, unless the requirements of external accrediting bodies make it impossible.

Revised 8-29-22

**Department/School Chair(s)**

| Signature | Approval date |
|---|---|
| | 9/11/23 |
| | |

**College Academic Council(s)**

| Signature | Approval date |
|---|---|
| Charla S Muirhead | 9/14/2023 |
| | |

**Dean(s)**

| Signature | Approval date |
|---|---|
| Charla S Muirhead | 9/14/2023 |
| | |

**Teacher Education Council**

| Chair's signature | Approval date |
|---|---|
| | |

**University General Education Council**

| Chair's signature | Approval date |
|---|---|
| | |

**Abilene Undergraduate Academic Council**

| Chair's signature | Approval date |
|---|---|
| | |

**Graduate Council**

| Chair's signature | Approval date |
|---|---|
| | |

**Provost**

| Signature | Approval date |
|---|---|
| | |

**Faculty**

| Chair of Faculty Senate | Approval date |
|---|---|
| | |

**President**

| Signature | Approval date |
|---|---|
| | |

**New Program Application: Bachelor of Science in Electrical Engineering**

## I. Program Identification

A. **Program title:** Electrical Engineering
B. **Degree type:** Bachelor of Science (BS)
C. **Home department or unit:** Department of Engineering and Physics
D. **Program developer(s) and credentials:** Darby Hewitt, Ph.D., Associate Professor
E. **Where program will be offered and delivery method:** Abilene campus, in-person
F. **Proposed date of implementation:** Fall 2024

## II. Program Details

### A. Program description:

*This 50- to 200-word explanation will be included in the catalog with degree plan.*

The BSEE degree provides students with fundamental knowledge of electric circuits, analog and digital electronics, microprocessors, signal processing, electricity and magnetism, and electric power. Students may choose 10 hours of upper-level electives to further specialize in particular sub-fields of the discipline according to their interests.

### B. Program mission statement:

*This should define what students will be equipped to do upon completion of the program.*

The ACU engineering program strongly supports the university's mission of educating students for Christian service and leadership throughout the world. The Electrical Engineering degree will prepare students to become leaders in electrical engineering and related fields and the background to live out their faith in their careers.

### C. Program outcomes:

In support of the university mission and in response to the needs of program constituents, the Program Educational Objectives (PEOs) are that within a few years of graduation:

1. Alumni are succeeding in engineering practice or other diverse fields that value analytical, problem solving, and professional practice skills.
2. Alumni are engaging in life-long learning that builds upon foundational knowledge acquired in their undergraduate education through graduate study, career-specific training, or other professional training.
3. Alumni are glorifying God through thoughtful integration of work and life, facilitating service to others through their profession.

Through completion of the Electrical Engineering program, graduates should 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.

**D. Description of target audience:**
This program is for any student interested in a career or graduate study in electrical engineering.

**E. Admission requirements**
Engineering majors must develop mathematical skills as well as design, experimental, and computational abilities. If the student does not qualify to take Calculus I (MATH 185) when the student enters ACU, his or her graduation may be delayed.

**F. Projected total enrollment for each of the first five years:**
35-50 students total each year, starting in Fall 2024

**G. CIP code:**
14.1001 Electrical, Electronics and Communications Engineering

## III. Rationale and Need for Program

**A. Mission fit:**
This program will support growth of the on-campus student population, because electrical engineering is one of the most popular engineering majors nationwide. The electrical engineering degree will also elevate the academic brand of ACU, because specific discipline engineering degrees are better recognized by incoming students and their parents and by potential employers than general engineering degrees.

**B. Societal need:**
*What gaps does this program fill? You can consider needs of an informed citizenry, practical needs of society, vocational connections of potential students, or other factors.*
Electrical engineers design and build devices in myriad industries, from cell phones to the power grid. This program will provide our students with the necessary skills to thrive as engineering practitioners, and to become leaders within their chosen industry.

**C. Employment demand and career possibilities:**
Graduates of this program will be qualified to pursue various engineering careers: electrical/electronics engineering, firmware/embedded systems engineering, power distribution engineering, transmission planning engineering, automation engineering, control engineering, and many more.

In Texas, the percent growth of employed electrical engineers is projected to increase by 11% from 2018 to 2028 according to the "Report on Texas Growth Occupations – 2021", published by the Texas Workforce Commission in January of 2022 (*https://www.twc.texas.gov/files/news/report-on-texas-growth-occupations-2021-twc.pdf*). According to this document, the average salary of electrical engineers in the state of Texas as of 2020 was $107, 472.

Nationwide trends show a more moderate, but still positive trend in employment for electrical engineers. The following table was published by the U.S. Bureau of Labor Statistics:

| Quick Facts: Electrical and Electronics Engineers | |
|---|---|
| 2021 Median Pay | $101,780 per year<br>$48.93 per hour |
| Typical Entry-Level Education | Bachelor's degree |
| Work Experience in a Related Occupation | None |
| On-the-job Training | None |
| Number of Jobs, 2021 | 303,800 |
| Job Outlook, 2021-31 | 3% (Slower than average) |
| Employment Change, 2021-31 | 9,800 |

(*https://www.bls.gov/ooh/architecture-and-engineering/electrical-and-electronics-engineers.htm*)

While this table shows a "slower than average" growth of electrical and electronics engineering jobs compared to other careers nationwide over the 10-year period between 2021 and 2031, this field is still projected to grow in the U.S. from 303,800 to 313,600 employed electrical and electronics engineers in that decade. And as stated in the table above, the typical entry-level education for these positions is a bachelor's degree like the one proposed in this document.

**D. Prospective student interest:**

We have already seen that our electrical engineering concentration within the general engineering program at ACU has attracted steady cohorts of 20-30% of our BSE graduates from 2021 to 2023. (4 of the 19 graduates in 2023 (21%), 4 of 16 in 2022 (25%), and 6 of 18 in 2021 (33%))

It is clear to any of the faculty in the Engineering and Physics Department who have helped with recruiting events that the addition of discipline-specific degrees (BSEE among them) will attract more students to ACU, particularly those students whose parents are in engineering careers themselves. I believe there are also many Physics majors and Computer Science majors at ACU who could be interested in majoring instead in electrical engineering.

**E. Disciplinary benchmarking:**

*How does this program curriculum compare to other programs in your discipline? Which Texas universities already offer this program? You may also note other peer institutions that offer the program.*

The curricula for Electrical Engineering programs is fairly uniform across most colleges and universities in the U.S. Larger schools with more faculty tend to offer more specialized courses in addition to their more standard courses, but the curriculum presented in this document covers the disciplinary breadth expected of any electrical engineering program in the country.

Electrical Engineering is offered at many of ACU's competing institutions including
Baylor University
Angelo State University
Tarleton State University
Harding University
Lipscomb University
Southern Methodist University
Texas Tech University
Texas A&M University
University of Texas, Austin
University of Texas, Arlington
University of Texas, Dallas

## IV. Curriculum

### A. Degree plan.

**Engineering Core**

- ENGR 115: Intro to Engineering and Physics – 1 credit hour
- ENGR 116: Intro to Engineering and Physics Lab – 1 credit hour
- ENGR 217: Engineering Career Skills – 1 credit hour
- ENGR 306: Engineering Ethics – 1 credit hours
- ENGR 317: Project Management – 1 credit hour
- ENGR 350: Engineering Economics – 3 credit hours *
- ENGR 390: Junior Clinic – 3 credit hours
- ENGR 430: Senior Clinic I – 2 credit hours
- ENGR 432 Senior Clinic II – 2 credit hours

**Total: 12 hours**

**Math/Science Requirements (30 hours required for ABET)**

- MATH 185: Calculus I – 3 credit hours *
- MATH 186: Calculus II – 3 credit hours
- MATH 286: Calculus III – 3 credit hours
- MATH 325: Linear Algebra – 3 credit hours
- MATH 361: ODE – 4 credit hours
- PHYS 220: EP I – 3 credit hours *
- PHYS 221: EP I Lab – 1 credit hour
- PHYS 222: EP II – 3 credit hours *
- PHYS 223: EP II Lab – 1 credit hour
- ENGR 377: Engineering Statistics – 3 credit hours
- Additionally, choose 4 hours from the following:
    - CHEM 131: General Chemistry I Lab – 1 credit hour
    - CHEM 133: General Chemistry I – 3 credit hours
    - PHYS 330: Modern Physics – 3 credit hours
    - PHYS 331: Modern Physics Lab – 1 credit hour

**Total: 22 hours**

**Electrical Engineering Core**

- CS 120: Programming I – 3 credit hours
- ENGR 135 Introduction to Electric Circuits – 3 credit hours
- ENGR 136: Introduction to Electric Circuits Lab – 1 credit hours
- ENGR 210: Digital Logic – 3 credit hours
- ENGR 355: Electronic Devices – 3 credit hours
- ENGR 356: Electronic Devices Laboratory – 1 credit hour
- ENGR 360: Electricity and Magnetism – 3 credit hours
- ENGR 315: Introduction to Embedded Systems – 3 credit hours
- ENGR 316: Introduction to Embedded Systems Lab – 1 credit hours
- ENGR 387: Power Electronics and Electromechanics – 3 credit hours
- ENGR 388: Network Analysis – 3 credit hours
- ENGR 410: Signal Processing – 3 credit hours

**Total: 30 credit hours**

**Advanced EE/ENGR Electives**

Each student must complete 10 additional hours of upper-level ECEN or ENGR courses not taken above.

**Choose 10 hours from the following:**

- ECEN 300-499
- ENGR 300-499

**Total: 10 credit hours**

**Electives: 0 credit hours**

**Total: 74 credit hours**

## B. Courses:

| Course Name | Rotation and Frequency | Required/ Menu | POs Served | Faculty to Teach |
|---|---|---|---|---|
| Electronic Devices | F, odd | R | 1 | Hewitt, Makarewicz |
| Electronic Devices Lab | F, odd | R | 1, 6 | Hewitt, Makarewicz |
| Electricity & Magnetism | S, even | R | 1 | Hewitt, PHYS Faculty |
| Network Analysis | S | R | 1 | Hewitt, Makarewicz |
| Signal Processing | S, odd | R | 1 | Hewitt, Makarewicz |
| Intro to Embedded Systems | F | R | 2, 3 | Hewitt, Makarewicz |
| Intro to Embedded Systems Lab | F | R | 2, 3, 6 | Hewitt, Makarewicz |
| Intro to Engr and Phys | F | R | 3 | All E&P |
| Intro to Engr and Phys Lab | F | R | 3, 5 | All E&P |
| Engineering Ethics | F | R | 4 | ENGR Faculty |
| Engineering Project Management | F | R | 3, 5 | ? |
| Programming I | F, S | R | 1 | CS Faculty |
| Intro. to Electric Circuits | F, S | R | 1 | Hewitt, Makarewicz, Phys/MechE Faculty |
| Intro to Electric Circuits Lab | F, S | R | 1, 6 | Hewitt, Makarewicz, Phys/MechE Faculty |
| Digital Logic | S | R | 1 | Hewitt, Makarewicz |
| Engineering Career Skills | F | R | 3 | Hewitt, Makarewicz |
| Engineering Economics | F | R | 2, 4 | Kennedy, ENGR Faculty |
| Statistics for Engineers | S | R | 1 | ? |
| Power Electronics and Electromechanics | F, even | R | 1 | Hewitt, Makarewicz |
| Junior Clinic | S | R | 3, 7 | ENGR Faculty |
| Senior Clinic I | F | R | 2, 3, 7 | EE Faculty |

| | | | | |
|---|---|---|---|---|
| Senior Clinic II | S | R | 2, 3, 7 | EE Faculty |
| Embedded Systems Design | S, even | M | 2, 3 | Hewitt, Makarewicz |
| Embedded Systems Design Lab | S, even | M | 2, 3, 6 | Hewitt, Makarewicz |
| Systems and Controls | S, odd | M | 1 | Hewitt, Makarewicz, MechE Faculty |

C. **New (and modified) courses:**

**Introduction to Embedded Systems/Lab (EE 3XX/3XX)**
*Description:*
Foundations of software and hardware development in the context of microcontroller-based systems. Topics include firmware development in C and assembly language, in-circuit debugging, GPIO, ADC, timer modules, hardware interrupts, and digital communication protocols (IIC, SPI, and UART). Prerequisite: CS120. Lab and lecture are corequisites.
*Existing programs served:*
Any engineering discipline as an ENGR elective, possibly CS students

**Embedded Systems Design/Lab (EE 422/423)**
*Description:*
Best practices in embedded systems design and development. Laboratory work focuses on the design, building, and testing of a student-proposed project. Topics will include design patterns in the context of embedded software, real-time operating systems (RTOS), version control for firmware development, and hardware debugging. Prerequisite: Introduction to Embedded Systems/Lab.
Lab and lecture are corequisites.
*Existing programs served:*
Any engineering discipline as an ENGR elective, possibly CS

## V. Assessment Plan

### A. Curriculum map.

In the following table, all required BSEE courses for this program are listed along with the frequency with which each course is offered, whether the course is required of all EE majors or is an elective, and the program outcomes supported by each course. The program outcomes are listed according to this pattern: [LO number][I/R/A, for Introductory, Reinforcing, or Advanced, respectively]

| Course Name | Rotation and Frequency | Required/Elective | POs Served; Introductory, Reinforcing, Advanced |
|---|---|---|---|
| Electronic Devices | F, odd | R | 1A |
| Electronic Devices Lab | F, odd | R | 1R,6R |
| Electricity & Magnetism | S, even | R | 1A |
| Network Analysis | S | R | 1A |
| Signal Processing | S, odd | R | 1A |
| Intro to Embedded Systems | F | R | 2R, 3R |
| Intro to Embedded Systems Lab | F | R | 2R, 3R, 6R |
| Intro to Engr and Phys | F | R | 3I |
| Intro to Engr and Phys Lab | F | R | 3I, 5I |
| Engineering Ethics | F | R | 4R |
| Engineering Project Management | F | R | 3R, 5R |
| Programming I | F, S | R | 1R |
| Intro. to Electric Circuits | F, S | R | 1R |
| Intro to Electric Circuits Lab | F, S | R | 1R, 6I |
| Digital Logic | S | R | 1I |
| Engineering Career Skills | F | R | 3R |
| Engineering Economics | F | R | 2R, 4R |
| Statistics for Engineers | S | R | 1R |
| Power Electronics and Electromechanics | F, even | R | 1A |
| Junior Clinic | S | R | 3R, 7I |
| Senior Clinic I | F | R | 2R, 3A, 7R |
| Senior Clinic II | S | R | 2R, 3A, 7A |
| Embedded Systems Design | S, even | E | 2A, 3A |
| Embedded Systems Design Lab | S, even | E | 2A, 3A, 6A |
| Systems and Controls | S, odd | E | 1A |

**B. Outcome assessment measures.**

Assessment of the program outcomes will be achieved through course assignments in select courses over a two-year cycle. For each program outcome, two work products will be collected and analyzed according to a rubric for that outcome during the two-year cycle. The two-year assessment cycle will conform to the structure outlined in the following table, with assessment instruments listed for each LO and course:

| | **Course in which LO will be assessed** | | | | | | |
|---|---|---|---|---|---|---|---|
| **LO:** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| **Fall, odd** | | EE 3XX Intro. Emb. Systems (Design Report) | ENGR 115 Intro. E&P (Project presentation) | ENGR 350 Engr. Econ. (Analysis project) | ENGR 116 Intro. E&P Lab. (team feedback surveys) | | |
| **Spring, even** | ENGR 388 Network Analysis (Test 2) | | | | ENGR 390 Jr. Clinic (team feedback surveys) | | ENGR 390 Jr. Clinic (preliminary design research report) |
| **Fall, even** | | ENGR 422 Sr. Clinic I (Critical Design Review) | | ENGR 306 Engr. Ethics (Case study analysis) | | EE 3XX Intro. Emb. Systems Lab. (Lab project write-ups) | ENGR 430 Sr. Clinic I (capstone report) |
| **Spring, odd** | ENGR 135 Intro. Circuits (Final Exam) | | ENGR 390 Jr. Clinic (Critical Design Review) | | | ENGR 136 Intro. Circuits Lab (practical exam) | |

For each of the courses listed in the table above, the corresponding assessment instruments will be evaluated based on a rubric which breaks out performance criteria for the particular learning outcome and defines three points of competency for each performance criterion—"does not meet expectations", "meets expectations", and "exceeds expectations".

In general, for each assessment, the competency target will start at 70% of students meeting or exceeding each of the performance criteria for the learning outcome. This competency target is generally consistent with those which have been used in assessing the learning outcomes for the general engineering program.

The ideal target for each outcome will be 80% of students meet or exceed each of the performance criteria for the learning outcome.

For each outcome, the instructor of record for the particular course will be responsible for measuring the outcome and for aggregating and analyzing the data. The assessment analysis for each outcome will be presented to the faculty within the Electrical Engineering program no later than the beginning of the semester following the analysis of the assessment. Course-level and/or program-level changes based on the assessment results will be determined by the program faculty during this meeting. Information about the assessment instrument, the course and semester in which the assessment has been administered, the analysis and results of the assessment, and the action items pertaining to the results of the assessment as determined by the larger body of faculty will be aggregated in a worksheet similar to the one attached at the end of this report (see Appendix A).

### C. Description of assessment cycle.

Because several assessments will be performed each semester, the results of each assessment will be discussed and action items based on those assessments will be determined by the program faculty no later than the beginning of the semester following the administration of the assessment.

## VI. Required Institutional Support

### A. Faculty requirements and availability.

The following table summarizes the EE faculty load hours available each semester with current electrical engineering-credentialed faculty and the required EE load hours for delivery of this new program. These numbers come from the degree requirements listed in section IV above. ***The general load requirements common to all engineering degrees are not included in this table.*** Two scenarios are presented—delivery of all proposed new courses, or delivery of just the Embedded Systems and Mechatronics-focused courses, omitting new offerings related to power electronics and energy distribution.

| | **Current faculty load hours available** | | | **EE Load hours required** | | **Extra EE faculty load hours** | |
|---|---|---|---|---|---|---|---|
| **Semester** | Joseph Makarewicz | Darby Hewitt | Total | Offering all proposed new EE courses | w/o Power Electronics and Energy Distribution courses | Offering all proposed EE courses | w/o Power Electronics and Energy Distribution courses |
| **F odd** | 15 | 9 | 24 | 23 | 23 | 1 | 1 |
| **S even** | 12 | 9 | 21 | 24-27 | 21-24 | (-6)–(-3) | (-3)-0 |
| **F even** | 15 | 9 | 24 | 22 | 19 | 2 | 5 |
| **S odd** | 12 | 9 | 21 | 23 | 19 | (-2) | 2 |

Currently, there are two full-time faculty members with electrical engineering credentials, and their total combined available load hours in fall and spring semesters are 24 and 21 hours, respectively. ***As shown in the table above, the Electrical Engineering course load requirements will necessitate the hire of two additional Electrical Engineering faculty members, because the general engineering course load requirements from the general Engineering Core courses will be distributed among the engineering faculty from all disciplines.*** Furthermore, the calculations summarized in the table above assume no additional load reduction due to administrative duties such as program directorship or department chair.

There are currently two engineering faculty with electrical engineering credentials–Darby Hewitt, and Joe Makarewicz. Given projected growth within the first few years of offering this discipline-specific program, at least 4 total faculty members with electrical engineering credentials will be needed, ideally with at least two tenure-track faculty. And, between them, Darby and Joe lack significant expertise in the realm of power electronics and distribution. As new faculty are hired, finding candidates with expertise in this subfield of electrical engineering would be preferred.

As enrollment increases, the department will likely need to hire additional staff. An additional lab manager and additional administrative assistance may both be necessary.

Key points here:

- To offer this program, it will be necessary to hire two additional Electrical Engineering faculty members within the first three years of offering the program, given projected growth
- As this program and other engineering programs at ACU grow further, additional faculty will be needed to cover multiple sections of the courses within the engineering core requirements
- We recommend hiring a new faculty member for this program with expertise in power electronics and energy distribution

A new hire for this program would ideally be offered a tenure-track position to support the longevity and stability of the program. According to ACU's CUPA comparison group data, the average starting salary for a new-

hire tenure-track Electrical Engineering faculty member at the rank of Assistant Professor is $89,879. In the past, applicant pools for open faculty positions in engineering at ACU have been small and underwhelming. Despite this trend, ACU has been fortunate to hire and retain many high-quality engineering faculty members. However, prior faculty searches have not been restricted to candidates with electrical engineering credentials, and this additional constraint will make hiring even more difficult.

### B. Impact on existing programs.

This program will likely draw some physics majors based on past trends observed in the EE concentration within the general engineering degree.

### C. Program director.

The program director will be Darby Hewitt, who holds MS and PhD degrees in Electrical and Computer Engineering (ECE) and is the only tenure-track faculty member currently with electrical engineering credentials.

### D. Staff requirements.

No new staff within the Engineering and Physics Department will be needed initially. Sustained growth of the program may necessitate additional staff in the future.

### E. Library resources.

The ACU Library already provides students and faculty with electronic access to most of the top journals within electrical engineering through IEEE Xplore. This database can be accessed directly with ACU credentials, or through the Brown Library website.

The ACU Library offers a wide range of resources tailored to engineering disciplines. These include comprehensive databases of engineering journals and research papers, e-books and reference books. Our electronic resources are accessible 24/7, allowing students and faculty to conduct research and access materials anytime, anywhere.

**INSPEC** - The leading bibliographic database to scientific and technical papers in physics, electrical engineering, electronics, communications, control engineering, computing, information technology, manufacturing, production and mechanical engineering. The INSPEC database covers 1969–present and the INSPEC archives covers 1898–1968.

**Science & Technology Collection** - Contains over 800 leading full text journals covering topics including aeronautics, astrophysics, chemistry, computer technology, geology, aviation, physics, archaeology, and materials science.

**IEEE Xplore Digital Library** - The IEEE Xplore Digital Library is the premier database for research in electrical engineering, electronics, computer science and related disciplines. IEEE Xplore includes full-text access to over 180 IEEE peer-reviewed journals and magazines; 1,500 annual conferences; active, archived and redline IEEE standards; as well as IET journals, magazines, and conferences.

**Scifinder Scholar Search** - SciFinder is a research discovery tool that allows you to explore the CAS databases that contain literature from many scientific disciplines, including biomedical sciences, chemistry, engineering, materials science, agricultural science, and more! Contains: CAS REGISTRYSM database, more than 16 million single- and multi-step reactions, more than 1 billion predicted property values, and more than 2 million experimental properties.

**Proquest SciTech Premium Collection** - The SciTech Premium Collection includes the Natural Science Collection and the Technology Collection and provides full-text titles from around the world, including scholarly journals, trade and industry journals, magazines, technical reports, conference proceedings, government publications, and more.

**ScienceDirect** - ScienceDirect is a leading full-text scientific database offering journal articles and book chapters from more than 2,500 peer-reviewed journals and more than 11,000 books. There are currently more than 11 million articles/chapters, a content base that is growing at a rate of almost 0.5 million additions per year.

**Wiley Online Library** - Multidisciplinary collection of online resources covering life, health and physical sciences, social science, and the humanities. It delivers seamless integrated access to over 4 million articles from 1500 journals, over 10,000 online books, and hundreds of reference works, laboratory protocols and databases.

**Scopus** - large abstract and citation database with more than 75 million records of journal articles, books, and conference papers. Scopus is unique in its features of discovery and analysis of shared authors, keywords, references, and citations.

Subject Librarians are available to assist with research inquiries, citation guidance, and utilizing information research tools.

**F. Physical resources.**

The current classroom, lab, and office spaces and equipment are sufficient to begin this program.

**G. Scholarships.**

The department of Engineering and Physics offers multiple competitive scholarships to its students, regardless of major. An endowed scholarship exclusively for electrical engineering students could be offered in the future, but there are no plans to offer such a scholarship and no such scholarship is currently available.

**H. Recruiting.**

This degree should be marketed toward students who are interested in engineering or physics.

**I. Additional cost to deliver program.**

Offering this program will necessitate a new faculty hire. This faculty member should be tenure-track, with a starting salary of roughly $89,879.

*Total expenses from sections A to H.*
*Clarify which expenses are one-time and which are ongoing.*
*When sections I-VI are complete, please submit to the Office of the Provost for initial review and development. Section VII is not required for all applications; you will learn whether it's required for your program during initial review.*

VII. Additional Information Required for Substantive Changes

A. Student support services. Describe specific programs, services, and activities that will support students enrolled in the program. Some examples of academic support services are teaching and resource centers, tutoring, academic advising, counseling, disability services, diversity and inclusion offices, teaching laboratories, career services, testing centers, student life, and information technology.

B. Describe financial resources available to support the new program, including a budget for the first year of the program; projected revenues, expenditures, and cash flow; amount of resources going to external institutions or organizations contracted to provide support services for the program; the operational, management, and physical resources available for the change.
C. Provide contingency plans in the event required resources do not materialize.

VIII. Supporting Documentation

*All applications are required to include Section VIII. Please compile this documentation after the initial review by the provost's office.*

A. Approval Chart for Curriculum Changes
B. Memo of support from the department chair of each department outside the home department that will provide a course for the program.
C. When the new program application is complete, provide the full proposal to the following individuals for review. Each will provide a memo to attach to the proposal.
    1. Assistant provost for institutional effectiveness and SACSCOC liaison for substantive change review.
    2. Dean of the library for library resources review.
    3. Dean of the college of the program for a statement of commitment to the items in Required Institutional Support.
    4. Assistant provost for curriculum and assessment for review of the program outcomes, curriculum map, and assessment plan and evaluation of compliance with academic policies.

**Appendix A: ABET Student Outcome Assessment Worksheet**

 SEMESTER:

Use this worksheet to facilitate completion of your Student Outcome Assessments

1. Name of faculty member responsible

2. ABET SO to be assessed (See list below, pick the ABET number and a few key words of the SO definition)

3. Course or activity where measure is used

4. Objective or standard that interprets the ABET Criterion (description of specific task/skill being assessed)

5. Description of test or instrument used to make the evaluation

6. Target week of the semester for assessment (aim for the window of weeks 5-13, and avoid finals week)

7. Name of rubric used to evaluate the students' performance on the test or instrument (Attach copy or paste copy onto next page)

8. Target result (e.g., "At least 60% of students meet or exceed expectations")

9. Results (may be entered on the rubric sheet)

10. Course of action (based on standard and goal for that standard. This should have departmental input and collaboration and would be done later, but in time to be incorporated into next course offering.)

 **Engineering Accreditation Commission Student Outcomes for ABET Accreditation**

Through completion of the Electrical Engineering program, graduates should 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.

# memo

To: Tim Head and Charla Miertschin

From: Jessica Smith

Date: September 14, 2023

Re: New Program Applications — Civil Engineering, Electrical Engineering, Mechanical Engineering

---

I commend the engineering faculty the work to propose thorough field-specific engineering program proposals. The curriculum is clear and makes good use of existing courses, and the program development process showed vision for the addition of additional discipline-specific courses as growing enrollment and additional faculty allow.

The curriculum is clearly linked to the proposed program outcomes, and the department has used its existing assessment plan as the foundation with some updates based on where measures will occur since some courses will be changing. However, the program outcomes and assessment plans of each program will need some revision before final approval of the proposal.

The proposed program outcomes are identical for the three programs. ACU requires at least one unique outcome per program. Thanks for beginning the discussion with me about whether it will make the most sense to update one outcome to focus on the specific area of practice or whether keeping the seven existing outcomes as presented an adding an eighth outcome unique to each program is the best fit for the programs. Resolving this allows us to clearly define each program and meet the expectations of the institution's accreditor, SACSCOC, and the disciplinary accreditor, ABET, where you plan to continue the department's accreditation.

Additionally, the university's best practice is for every program to measure every outcome every year. The minimum requirement for programs with six or more outcomes is to establish a two-year cycle where half of the measures are collected in odd years and half in even years. The proposed assessment plans use a three-year cycle that needs to be shortened. Additionally, the assessment plan will need to be updated to include unique measures for the discipline-specific outcome established for each program. The courses in the Civil Engineering Core, Electrical Engineering Core, and Mechanical Engineering Core sections are the best options for conducting course-embedded measures of the new/revised outcome because they are required for all students in that program.

We can resolve these focused questions while the programs continue to advance through campus faculty consideration. I will be glad to work with you as you consider options to address these issues, and I ask that you provide these updates to the applications by the first week of October. Assuming a positive vote from curriculum councils and campus faculty, the proposals will be ready to advance for the signatures of the Senior Vice President for Academic Affairs and the President when you resolve the questions outlined here in the proposals.

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Darby Hewitt <jdh03d@acu.edu>

# SACSCOC Notifcation of New Programs

**Chris Riley** <chris.riley@acu.edu> Mon, Aug 28, 2023 at 12:58 PM
To: Darby Hewitt <darby.hewitt@acu.edu>
Cc: Tim Head <tim.head@acu.edu>, Tim Kennedy <timothy.kennedy@acu.edu>, Robert Brown <rlb16c@acu.edu>, Susan Lewis <lewiss@acu.edu>

OK. Based on the 25-49% notification threshold for new content, it looks like we will only need to notify SACSOC related to the Civil (30%) and Mechanical (31%) and not Electrical (20%).

Thanks!

**Chris Riley, J.D., M.P.A.**
Assistant Professor, Department of Political Science and Criminal Justice
University Pre-Law Advisor
Title IX Co-Coordinator and SACSCOC Liaison
Abilene Christian University I ACU Box 29004 I Abilene, Texas 79699
p. 325-674-2000 I f. 325-674-4831
Student Hours

On Tue, Aug 22, 2023 at 3:57 PM Darby Hewitt <darby.hewitt@acu.edu> wrote:

> Hi Chris,
>
> Thanks for the email. That's great news! Your assumption is correct for most of the new courses, but some of the lab/lecture courses in EE have different numbers of hours (when not 3+1, it's usually 2+1) to accommodate 128 total hours in the degree plan. Here are the electronic versions of the reports for reference. All the new courses and their hour counts can be found in these.
>
> Thank you so much for your work on this.
>
> Sincerely,
>
> Darby Hewitt, Ph.D.
> Associate Professor of Engineering and Physics
> Interim Executive Director of Engineering
> Abilene Christian University
>
> On Tue, Aug 22, 2023 at 1:45 PM Chris Riley <chris.riley@acu.edu> wrote:
>
> > Good afternoon!
> >
> > Susan asked me to review the draft proposal for the three new engineering degrees regarding the timing of the notification/approval by SACSCOC.
> >
> > Based on my review of the new courses required for these programs (i.e., new content), it's likely that only notification will be required. In that regard, I assumed one credit hour for the new lab courses and three credit hours for each non-lab course. Is that right?
> >
> > The notification itself will need to occur following the approval of the new programs per ACU's curriculum process (and before the programs are implemented). I have all the information I need to notify SACSCOC except the implementation date. Once I receive that date and the confirmation that the programs have received internal approval, I will provide drafts of the notification for you to review prior to sending it to SACSCOC.

Please let me know if you have any questions!

**Chris Riley, J.D., M.P.A.**
Assistant Professor, Department of Political Science and Criminal Justice
University Pre-Law Advisor
Title IX Co-Coordinator and SACSCOC Liaison
Abilene Christian University I ACU Box 29004 I Abilene, Texas 79699
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# ABILENE CHRISTIAN UNIVERSITY

# LIBRARY

## M E M O R A N D U M

**DATE:** September 15, 2023

**TO:** Dr. Darby Hewitt

**FROM:** Mark McCallon, Associate Dean for Library Services

**RE:** New Program Proposal – Bachelor of Science in Electrical Engineering

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After reviewing the program application, the ACU Library can support the proposed program if it can maintain funding for subscription resources that the Library currently provides. See the information about current library resources in the program application. Thank you for letting us review the program application.

September 12, 2023

Dear Drs. Hewitt, Brown, and Kennedy,

Thank you sharing the assessment plans for Mechanical Engineering, Civil Engineering and Electrical Engineering degrees. Based on the Adams Center review of the assessment plans and conversations with each of you regarding assessment, we approve each of the three plans.

This letter is not meant to be a final approval in the degree application process. Instead, it is intended as a reference which will be read by your department chair and members of the council, who may also have questions or comments of their own.

We would like to thank you for allowing the Adams Center team to review the assessment plans. The instructional design team would love to work with you on your syllabus, as well as the design, development or revision of this and other courses. If there is anything else we can do to help you, please feel free to let me know.

On behalf of the Adams Center,

Dr. Laura Carroll
Assistant Provost for Teaching, Learning and Vocational Formation

.

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To: Darby Hewitt, Executive Director of Engineering

From: John Ehrke, Chair of Mathematics

Re: Memo of Support for New Engineering Programs

I have reviewed the proposals for new degrees in Mechanical, Civil and Electrical Engineering as put forth in program application. The mathematics department, as a member of the College of Science and Engineering is fully in support of these new programs as they show great promise to further college goals related to recruiting, retention, and academic excellence. As a matter of institutional support, however, it should be noted that the mathematics department is not currently able to adequately support the growth in enrollment predicted by these proposals.

Per the proposals, Mechanical engineering projects 75-100 students each year. Civil Engineering projects 18-50 students each year. And Electrical engineering projects 35-50 students total each year. This is 128-200 total students per year. Compared to present enrollment numbers this reflects a roughly 100% increase in engineering-related enrollments in our courses. Engineering students as a percentage in total enrollment for math courses which currently serve the major vary from ~50% in lower-level courses to as high as 80%+ in upper-level courses. Based on this expectation I will lay out the expected impact on mathematics course offerings.

The following mathematics courses exist in support of these degrees. I have included most recent Fall and Spring enrollments in these courses along with the predicted enrollment increases and changes to course hour offerings based on this proposal. Max enrollment represents the largest physical classroom space currently available to the

department. It should be noted that class sizes above 24-30 are not pedagogically sound for instruction above the 100 level, but we have maintained enrollments above that threshold for quite some time now in classes that serve engineering students. Numbers in parentheses indicated multiplier used for class increase projections. I'm also including a +3 credit hour increase per semester to capture maximum load

requirements for semesters where 1 or more classes unexpectedly need extra sections due to clustering. Courses like MATH 109 and MATH 227 will see enrollment increases as well, but the impact should be manageable.

Spring 2023

| Course | Enroll | Sections | Max Enroll | Projected Enrollment | Credit Hour Increase |
|---|---|---|---|---|---|
| MATH 124 – Pre-Calculus II | 26 | 1 | 32 | 39 (1.5) | +1.5 |
| MATH 185 – Calculus I | 30 | 2 | 32 | 48 (1.6) | +3 |
| MATH 186 – Calculus II | 35 | 1 | 42 | 56 (1.6) | +3 |
| MATH 286 – Calculus III | 19 | 1 | 42 | 30 (1.6) | +0 |
| MATH 325 – Linear Algebra | 29 | 1 | 42 | 46 (1.6) | +3 |
| MATH 361 – Ordinary Differential Eqns | 24 | 1 | 32 (lab) | 43 (1.8) | +4 |
| MATH 463 – Partial Differential Equations | 13 | 1 | 25 | 17 (1.3) | +0 |
| | | | | Subtotal | +14.5 |
| | | | | Total (+3) | +17.5 |

Fall 2023

| Course | Enroll | Sections | Max Enroll | Projected Enrollment | Credit Hour Increase |
|---|---|---|---|---|---|
| MATH 124 – Pre-Calculus II | 51 | 2 | 32 | 77 (1.5) | +0 |
| MATH 185 – Calculus I | 45 | 2 | 32 | 72 (1.6) | +3 |
| MATH 186 – Calculus II | 22 | 1 | 42 | 35 (1.6) | +1.5 |
| MATH 286 – Calculus III | 20 | 1 | 42 | 32 (1.6) | +0 |
| MATH 361 – Ordinary Differential Eqns | 32 | 1 | 32 (lab) | 58 (1.8) | +4 |
| | | | | Subtotal | +8.5 |
| | | | | Total (+3) | +11.5 |

Based on the above, the projected level of institutional support for the mathematics department is:

- An immediate increase of 1 FTE – preferred Ph.D. tenure-track for flexibility in teaching upper-level classes. (Note: This is in addition to the current need for a faculty member in statistics/actuarial science, for which we are currently hiring.)
- Adjunct help is unlikely to assist this issue as we already use 4-6 adjuncts regularly per semester.
- There may be an additional need for 1 FTE in the next 5 years depending on enrollments since the projections above (calling for 1 FTE) still have average class sizes well in excess of 30 students.
- The spring semester will be the hardest to cover for the department.

So, while the department is excited about the possibility of new students added by these programs, we are not in a position to support the projected growth. If we are not able to add a faculty hire this year in statistics, we will be completely unable to meet the demand beginning in 2024 and will need to close sections.

The department looks forward to working with Engineering and Physics, the College of Science and Engineering, and the University as we move forward on this plan.

Blessings,

*John Ehrke*

Dr. John Ehrke
Chair of Mathematics

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Darby Hewitt <jdh03d@acu.edu>

# Memo of support for new program proposals

**Jennifer Huddleston** <jrh11a@acu.edu> Mon, Sep 11, 2023 at 6:18 PM
To: Darby Hewitt <darby.hewitt@acu.edu>

Darby,

I support the inclusion of the BIOL classes listed in your proposals for both Mechanical Engineering and Civil Engineering.

Dr. Jennifer R. Huddleston

Associate Professor
Department Chair
Department of Biology
Abilene Christian University
202 Halbert-Walling Research Center
ACU Box 27868
Abilene, Texas 79699-7868
office: 325-674-2010
fax: 325-674-2009
jennifer.huddleston@acu.edu
**Book an appointment**
[Quoted text hidden]

# SCHOOL OF INFORMATION TECHNOLOGY AND COMPUTING

## M E M O R A N D U M

**DATE:** September 12, 2023

**FROM:** John Homer, Director for SITC

**RE:** Department approval for proposed Engineering programs

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The School of Information Technology and Computing supports the proposed creation of new programs for Electrical Engineering, Civil Engineering and Mechanical Engineering. We believe these distinct programs will prove to be beneficial to current and prospective students. We note that CS 120, an SITC course, is included in a menu in each program and attest that seats will be available in this course for students in these programs.

John Homer

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September 10, 2023

The department of Chemistry and Biochemistry supports the proposals for the B.S. degrees in Mechanical Engineering, Electrical Engineering, and Civil Engineering. The department can accommodate the students in the required and selection General Chemistry Courses.

Autumn Sutherlin, Ph.D.
Chair and Professor
Department of Chemistry and Biochemistry
Abilene Christian University