

Abilene Approval Chart for Curriculum Changes

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

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

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

I

The Civil Engineering degree is a natural outgrowth of the existing Civil Concentration of the current Bachelor of Science in 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 <i>or</i> 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./School¹	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.

Department/School Chair(s)	
	<u>9/11/23</u>
<i>Signature</i>	<i>Approval date</i>
_____	_____
<i>Signature</i>	<i>Approval date</i>

College Academic Council(s)	
<u>Charles M. Smith</u>	<u>9/14/2023</u>
<i>Signature</i>	<i>Approval date</i>
_____	_____
<i>Signature</i>	<i>Approval date</i>

Dean(s)	
<u>Charles M. Smith</u>	<u>9/14/2023</u>
<i>Signature</i>	<i>Approval date</i>
_____	_____
<i>Signature</i>	<i>Approval date</i>

Teacher Education Council	
_____	_____
<i>Chair's signature</i>	<i>Approval date</i>

University General Education Council	
_____	_____
<i>Chair's signature</i>	<i>Approval date</i>

Abilene Undergraduate Academic Council	
_____	_____
<i>Chair's signature</i>	<i>Approval date</i>

Graduate Council	
_____	_____
<i>Chair's signature</i>	<i>Approval date</i>

Provost	
_____	_____
<i>Signature</i>	<i>Approval date</i>

Faculty	
_____	_____
<i>Chair of Faculty Senate</i>	<i>Approval date</i>

President	
_____	_____
<i>Signature</i>	<i>Approval date</i>



CIVIL ENGINEERING

Program Application

Dr. Timothy Kennedy, PE

Executive Summary

Currently, ACU has a Bachelor of Science in Engineering degree with four different concentrations: Civil, Electrical, General, and Mechanical Engineering. By creating a specific Civil Engineering degree, a number of benefits are expected including recruiting, retention and employment opportunities. As a result, we expect better communication and more interest with prospective students, their parents, and prospective employers and thus growth of the engineering program as a whole.

Additional faculty in Civil Engineering will be required to provide the level of margin necessary to account for expected growth in the program. Also, moving to a specific Civil Engineering programs should include concentrations, which allow for a student to specialize in one of the six disciplines of Civil Engineering (construction engineering, geotechnical engineering, structural engineering, environmental engineering, transportation engineering and water resources engineering. Addition of concentrations within the Civil Engineering degree would be useful for recruiting, and provide courses that many students have already been requesting.

Concentrations that could be supported include Structural Engineering, Water Resources/Environmental Engineering, Construction Engineering, or Transportation/Land Development Engineering.

1. Program Identification

A. Program Title

Civil Engineering

B. Degree Type

Bachelor of Science

C. Home Department

Department of Engineering and Physics

D. Program Developers and Credentials

Timothy Kennedy – Ph.D. in Civil Engineering, Licensed Professional Engineer, Civil Engineering, Associate Professor of Engineering

E. Location and Delivery Method

The program will be residential on the Abilene campus. All courses will be offered face-to-face, with no plans for alternative delivery.

F. Proposed Date of Implementation

The program could begin as early as Fall 2024, many of the required courses are already being offered as electives to fulfill the Civil Concentration of the Bachelor of Science in Engineering (BSE). With a planned delivery date of Fall 2024, students could be advised into appropriate courses prior to the full implementation of the degree program.

2. Program Details

A. Program Description

The Civil Engineering program is designed to equip students with the knowledge and skills necessary to plan, design, construct, and maintain the physical infrastructure that shapes our modern world: airports, buildings, dams, bridges, harbors, pollution control facilities, water supply, and transportation systems. The program focuses on providing a strong civil engineering curriculum, while also nurturing creativity and practical problem-solving abilities.

Students in this program will learn to analyze complex engineering challenges, develop innovative solutions, and ensure the safety, sustainability, and efficiency of their designs. The first two years include foundational courses in mathematics, physical sciences, and basic engineering sciences. Additionally, students take courses in Bible, humanities, social science and introductory courses in engineering and design. The final two years are focused on developing technical competence and the ability to apply and communicate the knowledge that the student has gained to the design of complex civil engineering projects. Project based learning is an integral component in upper-level courses with a culminating yearlong industry-sponsored capstone project in the senior year.

Students will also work in teams to develop the collaboration and communication skills necessary to work with multidisciplinary teams. Graduates of this program will be well-prepared for diverse career opportunities in the civil engineering industry, where they can contribute to the development and improvement of infrastructure for the betterment of society.

B. Program Mission Statement

The mission of the civil engineering program is to provide an excellent civil engineering education that prepares graduates to enter jobs as complete engineers. Prepared technically, professionally, and spiritually. These well rounded professionals will exceed the needs of their employers, clients, and communities in a constantly changing world.

C. Program Outcomes

The following Program Educational Outcomes (PEOs) will be achieved 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 the 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.

The following Student Outcomes were adopted from ABET in support of the PEOs.

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. Target Audience

The Bachelor of Science in Civil Engineering is designed for individuals interested in planning, designing, constructing, and maintaining physical infrastructure. The target audience consists of students with a strong foundation in mathematics and science. They possess an eye for detail, enjoy problem-solving, and have a desire to make a positive impact on society.

Creativity is also valued in civil engineering, as students are required to find innovative solutions while considering factors such as safety, sustainability, and efficiency. Those with a practical orientation who appreciate the hands-on application of their work will find this degree program appealing.

Additionally, civil engineering offers diverse professional environments and opportunities for collaboration. Students can expect to work with architects, urban planners, environmental scientists, construction professionals, and government agencies.

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 1 (MATH 185) when the student enters ACU, his or her graduation may be delayed.

F. Projected Total Enrollment

It is projected that the program could reasonably grow to graduate between 10 and 25 students per year. These projections are based on data from past graduations of current Civil Concentration and data obtained from the Lightcast Q2 2023 Data Set.

Table 1: ACU BSE Graduates 2021-2024

Year	Number of Civil Engineering Concentration Graduates	Total BSE grads	% of total BSE Graduates
2021	6	16	37.5
2022	5	16	33.3
2023	8	21	38
2024	8	28	28.6

Table 2: BSCE Completions by Institution

Institution	Bachelor's Degree Completions	Market Share, %
Texas A&M College Station	238	20
The University of Texas at Austin	121	10.2
Texas Tech University	119	10
Rice University	21	1.8
Lamar University	20	1.7
Prairie View A&M University	17	1.7
Angelo State University	15	1.4
Southern Methodist University	15	1.3
West Texas A&M University	15	1.3
Tarleton State University	10	.8
LeTourneau University	9	.8

Using the data above to extrapolate based on a 50% retention rate (the national average for engineering) the following range and distribution of students is projected.

Table 3: Projected Enrollment in Civil Engineering

	Year 1 Enrollments	Year 2 Enrollments	Year 3 Enrollments	Year 4 Enrollments	Total CE Enrollment
Minimum	18	13	9	9	49

Maximum	50	35	25	25	135
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G. CIP Code

14.0801 Civil Engineering

3. Rationale and Need for New Program

A. Mission and Vision Fit

The mission fit of a civil engineering degree incorporates a purpose that aligns with the University's Christian values. A specific example includes it being a service-oriented discipline that has a specific calling to advance and protect the interests of society through development of infrastructure that people cannot live without. Additionally, Civil Engineering is a growing discipline and is attracting students, which will aid in the residential undergraduate growth. Civil Engineering is better recognized by industry as compared to a general engineering degree and thus will elevate the ACU brand.

B. Societal Need

Civil engineers play a role in most of the built environment used by society. These include but are not limited to, infrastructure planning, design, construction and maintenance, transportation systems, environmental sustainability, and water resource management. Current infrastructure scores a C in Texas ([TX ASCE Infrastructure Report Card](#))- and will need continued maintenance and design of new more resilient systems.

C. Employment Demand and Career Possibilities

By examining employment projection data from the Bureau of Labor and Statistics (BLS) for both the US (for 2021-2031) and Texas (for 2020-2030). Data indicates (see Tables 1 and 2) that the job outlook and demand is good for both the US and Texas.

Table 4: BLS Summary 2021-2031 (<https://www.bls.gov/ooh/architecture-and-engineering/civil-engineers.htm>)

Quick Facts: Civil Engineers	
2021 Median Pay ?	\$88,050 per year \$42.33 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 ?	318,300
Job Outlook, 2021-31 ?	7% (As fast as average)
Employment Change, 2021-31 ?	22,100

Table 5: Texas LMI data for 2020-2030 (<https://texaslmi.com/LMIbyCategory/Projections>)

Area	Occupation Title	Estimated Employment (2020)	Projected Employment (2030)	Percentage Change	Annualized Percent Growth	Annual Openings	Education
Texas	Civil Engineers	28,494	34,697	21.77	1.99	2,823	Bachelor's degree

D. Prospective Student Interest

Current graduation rates by discipline were examined to determine how large the student pool would be. Further, the data (Yoder, "Engineering by the Numbers", ASEE, 2021) indicated that student's interest (based upon number of graduates) in Civil engineering is second only to Mechanical engineering. Graduating students desire more depth in specific disciplines.

Table 6: Bachelors Degrees Awarded in US, 2021

1.1.1 Total Bachelor's Degrees Awarded by Engineering Discipline

Table 1: Bachelor's Degrees by Discipline: 146,233*

Discipline Name	Degrees Awarded
Mechanical	34,781
Computer Sci. (inside Eng.)	23,732
Computer Sci. (outside Engr.)	15,430
Civil	13,586
Electrical	13,495
Chemical	9,872
Computer	8,244
Biomedical	8,165
Industrial/Manufacturing/Systems	7,496
Other	7,231
Aerospace	5,166
Electrical/Computer	3,700
Engineering (General)	1,988
Metallurgical and Matrls.	1,841
Civil/Environmental	1,457
Biological and Agricultural	1,310
Envr. Eng	1,181
Petroleum	708
Engr. Science and Engr. Physics	689
Architectural	681
Nuclear	384
Engineering Management	375
Mining	151

* Total does not include computer science (outside engineering).

Table 7: Undergraduate Enrollment by Engineering Discipline, 2021

Table 31: Undergraduate Enrollment by Engineering Discipline: 586,589

Discipline Name	Enrollments
Mechanical	124,130
Computer Sci. (inside Eng.)	103,088
Other	53,418
Civil	46,763
Electrical	44,096
Computer Sci. (outside Engr.)	42,206
Biomedical	33,326
Chemical	33,164
Computer	31,533
Engineering (General)	26,004
Aerospace	22,805
Industrial/Manufacturing/Systems	20,186
Electrical/Computer	14,715
Envr. Eng	6,079
Civil/Environmental	5,795
Metallurgical and Matrls.	5,415
Biological and Agricultural	4,027
Architectural	3,320
Engr. Science and Engr. Physics	2,432
Petroleum	2,392
Engineering Management	1,859
Nuclear	1,440
Mining	602

* Total does not include Computer Science (outside engineering)

* Enrollment is for full time Bachelor's degree candidates in engineering.

E. Disciplinary Benchmarking

Below is a table of ACU competitors that indicates if they offer Civil Engineering.

Table 8: ACU Competitors

University	Civil Engineering Offered		University	Civil Engineering Offered
Texas A&M			UT-Rio Grande Valley	
Texas Tech			HSU	
Baylor			Grand Canyon	
Texas State			Harding	
UNT	Const Mgmt		OCU	
TCU			Pepperdine	
Tarleton			Liberty	
UT-Austin			OU	
UTSA			Lipscomb	
UT-Arlington			Cal Baptist	

4. Curriculum

A. Degree Plan

B. Engineering Core

- ENGR 115: Intro to ENGR – 1 credit hour
- ENGR 116: Intro to ENGR Lab – 1 credit hour
- ENGR 217: 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

- CHEM 131: General Chemistry I Lab – 1 credit hour
- CHEM 133: General Chemistry I – 3 credit hours *
- MATH 185: Calculus I – 3 credit hours *
- MATH 186: Calculus II – 3 credit hours
- MATH 286: Calculus III – 3 credit hours
- MATH 361: ODE – 4 credit hours
- PHYS 220: EP I – 3 credit hours *
- PHYS 221: EP I Lab – 1 credit hour
- ENGR 377: Engineering Statistics – 3 credit hours
- Students must choose 3 hours from the following:
 - AENV 130: Environmental and Technological Science – 3 credit hours
 - BIOL 112: General Biology – 3 credit hours
 - BIOL 353: General Microbiology – 3 credit hours
 - ENVR 233: Soil Science – 3 credit hours
 - GEOL 111: Introduction to Geology – 3 credit hours
- Students must choose 3 hours from the following:
 - CHEM 134 General Chemistry II – 3 credit hours
 - MATH 325: Linear Algebra – 3 credit hours
 - MATH 463: Partial Differential Equations – 3 credit hours
 - MATH 341: Numerical Methods – 3 credit hours
 - PHYS 222: Engineering Physics II – 3 credit hours
 - PHYS 351: Applied Numerical Methods – 3 credit hours

Total: 21 Hours

Civil Engineering Core

- ENGR 117: Comp. Tools – 1 credit hour
 - OR
 - CS 120: Programming I – 3 credit hours
 - ENGR 131: Computer Based Design – 1 credit hour
 - ENGR 220: Statics – 3 credit hours
 - ENGR 332: Mechanics of Materials – 3 credit hours
 - ENGR 333: Fluid Mechanics – 3 credit hours
 - ENGR 272: Surveying and Geomatics – 1 credit hour
 - ENGR 370: Structural Analysis – 3 credit hours
 - ENGR 372: Soil Mechanics – 3 credit hours
 - ENGR 376: Water Resources Engineering – 3 credit hours
 - ENGR 378: Introduction to Environmental Engineering – 3 credit hours
 - ENGR 3XX: Construction Engineering – 3 credit hours
 - ENGR 3XX: Civil Engineering Materials Lab – 1 credit hour
 - ENGR 3XX: Environmental Measurements Lab – 1 credit hour
- Total: 29-31 Hours**

Upper-Level Engineering

Each student must complete 12 additional hours of upper-level CIVE or ENGR courses not taken above.

Choose 9 hours from the following:

- CIVE 4XX: Surface Water Hydrology
- CIVE 4XX: Reinforced Concrete Design
- CIVE 4XX: Structural Steel Design
- CIVE 4XX: Water and Wastewater Design

Choose 3 hours from the following:

- CIVE 300-499
- ENGR 300-499

Total: 12 Hours

Electives: 0 credit hours

Total: 74-76 credit hours

C. Courses

There are four tables below. Table 9 provides an overview of the core courses which will be required of students in any of the Engineering programs. Table 10 lists the courses required of Civil Engineering students. Table 11 includes courses required for potential CE concentrations (or tracks) available to Civil Engineering students. Finally, the fourth provides additional details for new and modified courses.

Table 9: Proposed Engineering Core Curriculum

Engineering Core, Required for all Engineering Majors	Credit Hours	Offerings
ENGR 115: Introduction to Engineering and Physics	1	Fall
ENGR 116: Introduction to Engineering and Physics Lab	1	Fall
ENGR 117: Computational tools for Engineers	1	Spring
ENGR 131: Computer Based Design	1	Each Semester
ENGR 217: Career Skills	1	Fall
ENGR 306: Engineering Ethics	1	Fall
ENGR 317: Project Management	1	Fall
ENGR 350: Engineering Economics	3	Fall
ENGR 377: Engineering Statistics	3	Spring
ENGR 390: Jr. Clinic	3	Spring
ENGR 430: Sr. Clinic I	2	Fall
ENGR 432: Sr. Clinic II	2	Spring

Table 10: Proposed Civil Engineering Core Curriculum

Civil Engineering Required Courses	Credit Hours	Offerings
ENGR 220: Statics	3	Each Semester
ENGR 272: Surveying and Geomatics	1	Fall
ENGR 332: Mechanics of Materials	3	Each Semester
ENGR 333: Fluid Mechanics	3	Each Semester
ENGR 370: Structural Analysis	3	Fall
ENGR 372: Soil Mechanics	3	Spring
ENGR 376: Water Resources Engineering	3	Spring
ENGR 378: Introduction to Environmental Engineering	3	Fall
ENGR 3XX: Construction Engineering	3	Fall
ENGR 3XX: Civil Engineering Materials Lab	1	Spring
ENGR 3XX: Environmental Measurements Lab	1	Spring
ENGR Electives from Menu	9	Varies
ENGR Elective	3	Varies

Table 12: All New Courses

Course Title	Description
CE 4XX: Reinforced Concrete Design	An analysis, design and synthesis course for concrete structures, emphasizing strength design method. Topics include strength and serviceability requirements, design of one-way slabs, rectangular beams, flanged sections and columns, for strength, shear, bond, bearing, and serviceability. Building codes, American Concrete Institute (ACI) specifications, material specifications, test methods, and recommended practice documents are involved.
CE 4XX: Structural Steel Design	Design of structural steel elements found in building structures, including tension members, compression members, beams, beam-columns and base plates; design of bolted and welded simple connections; design of bolted eccentric connections; design of bolted and welded partially and fully restrained connections.
CE 4XX: Water and Wastewater Design	Development of engineering skills in the delivery of safe and reliable water supplies and the effective treatment of wastewater for discharge. Topics include hydraulic design within a treatment plant, potable water treatment technologies, wastewater collection, wastewater treatment and sludge processing.
CE 4XX: Surface Water Hydrology	Hydrologic analysis and modeling of surface water components of the hydrologic cycle including runoff, hydrographs, and surface water storage. Includes integrated lab component covering computer modeling with design for analysis.
ENGR 3XX: Construction Engineering	Principles of construction engineering and the project management process, value engineering, specifications, different construction contracts and delivery methods, estimating and scheduling fundamentals and project control, and management of construction process
ENGR 3XX: Civil Engineering Materials Lab	A study of Civil Engineering materials. Materials science and engineering: properties, economics, quality and sustainability. Materials include: metals, aggregates, Portland cement and asphalt concrete, mix design. Wood, masonry, and novel materials,
ENGR 3XX: Environmental Measurements Lab	Laboratory examinations of water, wastewater, and air. Water and air quality parameters and their significance. Sources and types of pollutants and their effects.

5. Assessment Plan

A. Curriculum Map

Table 13: Engineering Core Assessment Map

	115	116	217	306	317	350	377	390	430	432
SO 1 - Problem Solving	X	X	X		X	X	X	X	X	X
SO 2 - Application of Design Principles	X	X				X			X	X
SO 3 - Communication		X	X	X		X	X		X	X
SO 4 - Decision Making	X	X		X	X	X			X	X
SO 5 - Teamwork		X				X	X	X	X	X
SO 6 - Experimentation					X		X		X	X
SO 7 - Learning Strategies			X					X	X	X

8.

	117	131	220	272	332	333	370	372	376	378	CONS T. EN GR	CE M AT LS	EN VE M EA S.
SO 1 - Problem Solving	X	X	X	X	X	X	X	X	X	X	X	X	
SO 2 - Application of Design Principles			X			X	X	X	X	X			
SO 3 - Communication			X	X		X			X	X		X	X
SO 4 - Decision Making									X	X	X		
SO 5 - Teamwork				X					X	X		X	X
SO 6 - Experimentation	X			X								X	X
SO 7 - Learning Strategies						X		X	X	X			

9.

B. Outcome Measures

ABET Student Outcomes

SO 1 (Solve Problems) - an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

SO 2 (Design Application) - 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

SO 3 (Communication) - an ability to communicate effectively with a range of audiences

SO 4 (Ethics/Decision Making) - 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

SO 5 (Teamwork) - 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

SO 6 (Experimentation) - an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

SO 7 (Learning Strategies) - an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

C. Assessment Cycle

Current ENGR Assessment Plan

Fall 2023	1	ENGR 333 (Fluid Mechanics)
	4	ENGR 306 (Ethics)
Spring 2024	3	ENGR 432 (Senior Clinic)
	6	ENGR 432 (Senior Clinic)
	7	ENGR 390 (Junior Clinic)
Fall 2024	3	ENGR 221 (Engineering Mechanics: Statics/Dynamics)
	5	ENGR 116 (Introduction to Engineering and Physics Laboratory)
	7	ENGR 430 (Senior Clinic)
Spring 2025	1	ENGR 281 (Thermodynamics)
	6	ENGR 136 (Introduction to Electric Circuits Laboratory)
Fall 2025	2	ENGR 116 (Introduction to Engineering and Physics Laboratory)
	4	ENGR 115 (Introduction to Engineering and Physics)
Spring 2026	2	ENGR 430/432 (Senior Clinic)
	5	ENGR 390 (Junior Clinic)

New CE Assessment Plan

Fall 2023	1	ENGR 333 (Fluid Mechanics)
	4	ENGR 306 (Ethics)
Spring 2024	3	ENGR 432 (Senior Clinic)
	6	ENGR 432 (Senior Clinic)
	7	ENGR 390 (Junior Clinic)
Fall 2024	3	ENGR 430 (Senior Clinic)
	5	ENGR 116 (Introduction to Engineering and Physics Laboratory)
	7	ENGR 217 Engineering Career Skills
Spring 2025	1	ENGR 220 Statics
	6	ENGR Environmental Measurements Lab

Fall 2025	2	ENGR 116 (Introduction to Engineering and Physics Laboratory)
	4	ENGR 115 (Introduction to Engineering and Physics)
Spring 2026	2	ENGR 430/432 (Senior Clinic)
	5	ENGR 390 (Junior Clinic)

Changes to current assessments:

- ENGR 136 will no longer be part of the curriculum – Replace with ENRG 3XX (Environmental Measurements Lab)
- ENGR 221 will no longer be part of the curriculum – Replace with ENGR 217 Engineering Career Skills
- ENGR 281 will no longer be part of the curriculum – Replace with ENGR 220 Statics

6. Institutional Support

A. Faculty Requirements and Availability

I. Current Courses and Faculty Load

[The ENGR MASTER List](#) provides the proposed course load and faculty availability, for the Fall/Spring of even/odd years. Teaching load is significantly higher in the Fall due to the large number of sections of ENGR 115 and ENGR 116.

In Civil Engineering there is a need for two additional faculty, bringing the total number of faculty members with civil engineering credentials to 4. Ideally, at least two of these would be tenure-track faculty to support the longevity of the program.

B. Impact on Existing Programs

General Engineering will decrease drastically as more discipline specific programs become available. This will likely lead to the need to shut down that degree. It could lie in the Mechanical engineering degree as they are already very similar. Additionally, the Department of Engineering and Physics will grow and thus need to consider future of having all these programs in one department.

C. Program Director

Possibilities:

- Tim Kennedy
- Shinyu Kang

D. Staff Requirements

With current enrollment two faculty will be needed. If enrollment expands, more will be needed.

E. Library Resources

Library resource requirements are typically limited for students in Engineering programs. It is unlikely that additional resources will be required.

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

With current enrollment, no new space or physical resource is needed. If enrollment expands, more will be needed. Specifically, in Bennett as many Civil Engineering lab require the use of concrete and soils and are thus not recommended to be performed in the Onstead Science Center.

G. Scholarships

Many scholarships are available through societies, ASCE, TSPE, AWWA, WEF, AISC, etc (ASCE FW chapter offers 2 to ACU members). Additionally, there are some engineering specific scholarships available through ACU as well as ambassador scholarships.

H. Recruiting

Continuation of a student success manager specific to engineering will help this program grow.

I. Additional Cost to Deliver

The following additional costs will be required to deliver the program.

Additional faculty (2).

Course development

7. Additional Information for Substantive Changes

A. Student Support Services

Add info here

B. Financial Resources

Add info here

C. Contingency Plans

Add info here

8. Supporting Documentation

A. Approval Chart for Curriculum Changes

Add info here

B. Memos of Support

Add info here

C. Memos from Individuals

Add info here

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 and 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.

SACSCOC Notification 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 SACSCOC 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 | ACU Box 29004 | Abilene, Texas 79699

p. 325-674-2000 | 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

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[Student Hours](#)

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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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 Civil Engineering

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 proposal. Thank you for letting us review the proposal.

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

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

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]

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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



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