REVISED

Agenda Item No. 6.13

AGENDA ITEM BRIEFING

Submitted by: Michael K. Young, President
Texas A&M University

Subject: Approval of a New Bachelor of Science with a Major in Architectural Engineering Degree Program, and Authorization to Request Approval from the Texas Higher Education Coordinating Board

Proposed Board Action:

Approve the establishment of a new degree program at Texas A&M University (Texas A&M) leading to a Bachelor of Science in Architectural Engineering (BS AREN)**,** authorize the submission of this degree program to the Texas Higher Education Coordinating Board (THECB) for approval and certify that all applicable THECB criteria have been met.

Background Information:

The BS AREN degree program consists of 128 semester credit hours and will offer an interdisciplinary learning environment that combines courses and experiences in civil, mechanical and electrical engineering; engineering technology; and architecture and construction science. Graduates will acquire a specialization in one of the four basic architectural engineering curriculum areas: building structures, building mechanical systems, building electrical systems, and construction/construction management. Graduates will reach the synthesis (design) level in one of these areas, the application level in a second area, and the comprehension level in the remaining two areas.

The BS AREN degree program is designed to meet the General Criteria of the Engineering Accreditation Commission of ABET and accreditation will be sought at the appropriate time.

A&M System Funding or Other Financial Implications:

In order to offer the BS AREN degree with two architectural engineering tracks and the development of a third, three new faculty and a graduate student will be required to complement existing resources in the participating departments. The anticipated new cost over the first five years is $1,990,000 which will be covered through reallocated funds, and anticipated revenue is $5,119,978.

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TEXAS A&M UNIVERSITY
Office of the President
April 24, 2018

Members, Board of Regents
The Texas A&M University System

Subject: Approval of a New Bachelor of Science with a Major in Architectural Engineering Degree Program, and Authorization to Request Approval from the Texas Higher Education Coordinating Board

I recommend adoption of the following minute order:

> **"The Board of Regents of The Texas A&M University System approves the establishment of a new degree program at Texas A&M University leading to a Bachelor of Science in Architectural Engineering.**
>
> **The Board also authorizes submission of Texas A&M University's new degree program request to the Texas Higher Education Coordinating Board for approval and hereby certifies that all applicable criteria of the Coordinating Board have been met."**

Respectfully submitted,

[ORIGINAL SIGNED BY]

Michael K. Young
President

Approval Recommended:

[ORIGINAL SIGNED BY
Billy Hamilton FOR]

John Sharp
Chancellor

[ORIGINAL SIGNED BY]

Billy Hamilton
Executive Vice Chancellor and
Chief Financial Officer

[ORIGINAL SIGNED BY]

James R. Hallmark, Ph.D.
Vice Chancellor for Academic Affairs

Approved for Legal Sufficiency:

[ORIGINAL SIGNED BY]

Ray Bonilla
General Counsel

Texas A&M University

Bachelor of Science
with a major in Architectural Engineering
(CIP 14.0401.00)

Program Review Outline

BACKGROUND & PROGRAM DESCRIPTION

Administrative Unit: College of Engineering

The architectural engineering discipline refers to the application of scientific and engineering principles and technologies for the design, construction, operation, and maintenance of building systems. Typical engineered building-systems include: heating, ventilation, and air-conditioning (HVAC); structure; electrical power and lighting; fire protection; and communication and controls. The Bachelor of Science in Architectural Engineering (BS AREN) will prepare graduates for professional engineering practice within the architectural, engineering and construction (AEC) industry; service as licensed professional engineers in consulting firms, suppliers or government agencies; or successful completion of graduate studies in engineering or other areas. The BS AREN degree program consists of 128 semester credit hours (SCH) and will offer an interdisciplinary learning environment that combines courses and experiences in civil, mechanical and electrical engineering; engineering technology; and architecture and construction science. Graduates will acquire specialization level in one building system area and a proficiency level in another one.

The education objectives of the BS AREN degree program are to produce graduates who are prepared to apply scientific and engineering principles and technologies for the design, construction, operation, and maintenance of building systems. The design level must be in a context that:

1. considers the systems or processes from other architectural engineering curricular areas;
2. works within the overall architectural design;
3. includes communication and collaboration with other design or construction team members;
4. includes computer-based technology and considers applicable codes and standards; and
5. considers fundamental attributes of building performance and sustainability.

The four basic architectural engineering curriculum areas are building structures, building mechanical systems, building electrical systems, and construction/construction management. Graduates will reach the synthesis (design) level in one of these areas, the application level in a second area, and the comprehension level in the remaining two areas.

The proposed implementation date is fall 2019.

Texas A&M University (Texas A&M) certifies that the proposed new degree program meets the criteria under 19 Texas Administrative Code, Section 5.45 in regards to need, quality, financial

and faculty resources, standards and costs. New costs during the first five years will not exceed $2 million.

I. NEED

A. Employment Opportunities

The BS AREN degree will prepare undergraduate students for careers in the AEC and building industry. The Program Development Committee conducted investigations to evaluate the need for a BS AREN degree program at Texas A&M. These included market analysis, industry surveys and consultation workshops, a review of similar U.S. programs, and a review of existing courses and existing capabilities relevant to an undergraduate degree in architectural engineering. About 150 senior members of the building industry responded to a 2015-16 survey designed by the Program Development Committee. The survey found a very strong interest in architectural engineering graduates, with 92% of respondents expressing strong interest in hiring architectural engineers.

The job market for architectural engineers has been consistently very strong and aligned with the demands for civil and mechanical engineers, as well as with forecasts for new construction, renovation, and urbanization. Architectural engineering is a multi-disciplinary field and has a job outlook similar to its various disciplines including civil, mechanical, and electrical engineering, as well as to construction management. According to the Bureau of Labor Statistics (BLS), "employment of architecture and engineering occupations is projected to grow 7 percent from 2016 to 2026…Most of the projected job growth in this group is in the engineer occupations." This represents about 194,300 new jobs. Within the same period, BLS forecasts job growth of 11% for civil engineers (25,300 new jobs), 11% for construction management (44,800 new jobs), 9% for mechanical engineers (25,300 new jobs), and 7% for electrical engineers and electronics (25,300 new jobs).

The total number of 2016 graduates from all existing U.S. architectural engineering programs was only 618, according to the American Society for Engineering Education. The shortage of knowledge-based professionals in the building sector has been consistently documented and widely reported as critical for decades.

B. Projected Enrollment

The College of Engineering currently admits entering freshmen into the general engineering program whereby most students follow a common first-year engineering curriculum. Students interested in the proposed BS AREN degree program will apply using the same entry-to-a-major process for all existing engineering majors. It is assumed that most BS AREN majors will be full-time students. The college anticipates that approximately 25 students will enter the BS AREN program per year in the first four years, then increase to approximately 50 students per year in year five. This trend puts the total BS AREN enrollment growing to 97-100 by year four, then growing to a steady state of 175-200 by year eight.

C. Existing State Programs

There are three existing architectural engineering programs in the state of Texas: Texas A&M University-Kingsville (Texas A&M-Kingsville), the University of Texas at Arlington (UTA), and the University of Texas at Austin (UT). Texas A&M-Kingsville has an ABET accredited Department of Civil and Architectural Engineering that offers a bachelor's degree in architectural engineering. UTA offers a B.S. in Architectural Engineering that began in fall 2015, with a current focus on structural systems, housed in the Department of Civil Engineering. UT has an ABET accredited Department of Civil, Architectural, and Environmental Engineering that offers a B.S. in Architectural Engineering. It also offers M.S. and Ph.D. degrees in civil engineering where students can select from a few architectural engineering related areas of study, primarily in structural systems and building energy and environments. Enrollment and graduate numbers for the three existing undergraduate degrees in architectural engineering are as follows:

Fall Enrollment				Program	Yearly Graduates				
2014	**2015**	**2016**	**2017**		**13-14**	**14-15**	**15-16**	**16-17**	**Total**
63	84	106	106	**Texas A&M-Kingsville**	12	2	13	18	45
-	17	49	55	**UTA**	-	-	-	-	-
184	166	186	182	**UT**	37	42	42	50	171

II. QUALITY & RESOURCES

A. Faculty

In order to offer the BS AREN degree with two architectural engineering tracks and the development of a third, three new faculty and one graduate student will be required to complement existing resources in the participating departments. These three new faculty will include a combination of tenure/tenure-track professors and professors of practice to cover courses on introduction to architectural engineering, construction graphics communication, architectural engineering systems, advanced HVAC design, electrical/lighting systems, and capstone projects.

B. Program Administration

The program will be managed by a program director and an advising committee composed of a tenured or tenure-track faculty representative from each of the four participating engineering departments, as well as a faculty representative from both the Architecture Department and the Construction Science Department in the College of Architecture. An Industry Advisory Panel will provide strategic and operational advice to the management of the program.

C. Other Personnel

~~Clerical staffing support will be provided by the College of Engineering. Department and college graduate teaching assistants will provide support for laboratory instruction.~~A new architectural engineering program office will need to be established to coordinate recruiting, student inquiries, and plan of study monitoring and control.

D. Supplies, Materials

Some new s~~Adequate s~~upplies and materials, IT resources, and instructional costs will be required for the proposed program, including applications tools and software, site visits and industry interactions.~~are in place in contributing departments and the college.~~

E. Library

All necessary library resources are already in place, both at the university level and via internet searches.

F. Equipment, Facilities

Each engineering department currently houses all the laboratory, computational and pedagogical resources to support the proposed program, and the newly established 16,000 sq. ft. Engineering Innovation Center (EIC) is well equipped to support interdisciplinary interactions among undergraduate students at various stages of the program. In addition to the EIC, the newly established RELLIS campus is designed as a living laboratory for BS AREN students, which also includes the facilities of the Energy Systems Laboratory, the Smart Grid Center, and the Center for Urban Renewal. Additionally, students will have access to the facilities and expertise of the Texas A&M Engineering Extension Service on fire safety in buildings.

G. Accreditation

The BS AREN program curriculum is designed to meet the General Criteria of the Engineering Accreditation Commission (EAC) of ABET. The applicable criteria are the program criteria for Architectural and Similarly Named Engineering Programs. The lead society from which program evaluators are appointed is the American Society of Civil Engineers. All eligible engineering programs in the College of Engineering are accredited by the EAC of ABET, so the College is very familiar with expectations for accredited engineering programs. The College will use its experience with the accreditation process to seek accreditation for the BS AREN degree program.

III. NEW 5-YEAR COSTS & FUNDING SOURCES

NEW FIVE-YEAR COSTS			SOURCES OF FUNDING	
Faculty	$1,2068**0**,000		Formula Income	$388,373
Program Administration and Clerical/Staff	$3522**0**,000		Statutory Tuition	$595,500
Graduate Assistants	$159**0**,000		Reallocation	$0
Supplies & Materials	$25,000		Designated Tuition	$2,805,639
Library & IT Resources	$150,000		Other Funding:	
Equipment, Facilities	$0		Student Fees	$1,330,466
Other (professional fees, site visits, lecture series and national competitions)	$115,000			
Estimated New 5-Year Costs	$1,990,000		**Estimated 5-Year Revenues**	$5,119,978

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President

Approval Recommended:

[ORIGINAL SIGNED BY
Billy Hamilton FOR]

John Sharp
Chancellor

[ORIGINAL SIGNED BY]

Billy Hamilton
Executive Vice Chancellor and
Chief Financial Officer

[ORIGINAL SIGNED BY]

James R. Hallmark, Ph.D.
Vice Chancellor for Academic Affairs

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