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Transforming the Applied Engineering Curriculum: Bridging Student Potential and Industry Demands

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Abstract

This session will present the proposed curriculum revision of the Applied Engineering (AE) program at Keiser University (KU), including the development of a new certification program. The objective is to improve enrollment and long-term sustainability of the program while aligning the program with industry needs and academic standards. Offering an innovative curriculum in engineering is critical in private and midsize universities such as Keiser University, whose student recruitment and retention strategies often rely not only on the program's quality but also on its uniqueness. Furthermore, private universities have greater flexibility in working alongside the industry in implementing innovative and timely curriculum design changes that support economic growth and start-up companies. Additionally, exposing students to applied engineering majors through innovative interventions can foster early motivation and provide a clearer understanding of the roles and responsibilities of professional engineers. The implementation of the proposed curriculum is anticipated to provide a robust and comprehensive educational experience that effectively addresses industry demands while catering to the diverse needs of students.

I. INTRODUCTION

Achieving technological and scientific literacy is critical to ensuring America's competitiveness in the 21st century. To maintain a highly advanced technological society, it is essential to educate and inspire students in science, technology, engineering, and mathematics (STEM) at all levels. This effort will help sustain a robust pipeline of future engineers and computer scientists. Engineering, in particular, plays a vital role due to its profound impact on all sectors of society, industries, the economy, national security, and the educational community. Additionally, the growth of the Information Technology (IT) sector and related computer industries is projected to increase exponentially over the next decade. For instance, the medical and healthcare industries will demand innovative hardware and software solutions to manage healthcare systems effectively. This demand is expected to drive a 12.9% growth in engineering and computer-related industries from 2023 to 2033 [1], [2]-[5]. The expansion of engineering and computer occupations will primarily be fueled by the need for continuous development of artificial intelligence (AI) solutions and the increasing availability of data for analysis.

Further emphasizing this trend, U.S. News & World Report has ranked jobs in healthcare and STEM fields as the front runners in its 2025 rankings. Notably, four out of the top 10 best jobs are in STEM-related fields, with the role of IT Manager ranked second, following Nurse Practitioner [6]. Cybersecurity-related jobs are also anticipated to grow at a remarkable rate of 33% between 2023 and 2033, significantly outpacing the average growth rate for all occupations. According to a recent Pew Research Center analysis [7], employment in STEM fields grew by 13% from 2012 to 2022, surpassing the 11% growth rate projected for all occupations during that period. Furthermore, over 99% of STEM employment is concentrated in roles that typically require some level of post-secondary education for entry, compared to just 36% for all other jobs [8].

Given these trends, post-secondary institutions, including [University], must accelerate their efforts to produce STEM graduates who can meet the nation's expanding infrastructure and security needs. Another critical challenge is to increase the number of graduates from underrepresented and diverse populations, including low-income and minority students, particularly Hispanic students, in engineering [4], [9]-[10]. Revising the curriculum to address these needs is believed to be an essential step toward building a more diverse and capable workforce [3]-[4].

The proposed curriculum revisions align with evidence-based research and recommendations from the National Academy of Sciences, Engineering, and Medicine [9], the National Research Council [11]-[14], and the National Academy of Engineering [15]-[17]. Additionally, these revisions are informed by best practices derived from two of the principal investigators' STEM projects funded by the State of Florida and the U.S. Department of Education [18]-[22].

II. KEISER UNIVERSITY

Keiser University (KU) is one of the most diverse institutions of higher education in the State of Florida. According to 2025 U.S. News and World Report, for the fifth consecutive year; KU has earned a top 25 spot in the Best Colleges Social Mobility ranking where the university has been recognized for its efforts to foster upward mobility and support students from diverse economic backgrounds. The KU main campus is located in Fort Lauderdale, with campuses located throughout the State of Florida. Through quality teaching, learning, and research, the university is committed to providing students with opportunities to develop the knowledge, understanding, and skills necessary for successful employment. Committed to a "students first" philosophy, Keiser University prepares graduates for careers in business, health care, engineering, information technology, education, and career-focused general studies. Inherent in the KU Mission is service to the community. This service includes community partnerships, involvement with various constituencies, and various continuing education programs.

Keiser University has 20,102 students, with 70% of full-time undergraduate students receiving financial aid. The full-time KU undergraduate population is composed of 71% female and 29% male students. Keiser University's Hispanic student population has risen from 28.1% last year (US DOE, 2023) to more than 31.4% (US, DOE 2024) Hispanics, and 19% Black or African Americans in 2024. Table 1 presents the most recent DOE data for the KU student population (IPEDS, 2024).

Table 1- Keiser University Overall Student Population

KU	Overall	UG	Pell	FT	Black	Hispanics (UG)	Native American	Pacific Island	Total Minority
Population	20102	17,287	11,860	13,236	3,812	6312	133	54	9,850
Percentage	100%	86. %	59%	65%	19%	31.4%	0.7%	0.3%	49%

Hispanic students comprise a large portion of the KU student population. According to the 2020 census profiles for the state, all of Florida's 10 largest counties have significant Latino populations (Census, 2020). The Latino share of these counties' population ranges from 10.7% in Pinellas County to 68.7% in Miami-Dade County. Over three-quarters of Florida Latinos (76.5%) live in these counties, with 32.6% residing in Miami-Dade County. Additionally, eight of the 10 largest Florida counties are also home to the state's largest Latino communities, including Miami-Dade County, Broward County, Orange County, Hillsborough County, Palm Beach County, Polk County, Lee County, and Duval County. Given the fact that [University]'s headquarter is in Broward County, the demographic of Latino students is expected to exponentially increase for years to come.

Most KU students are Pell-eligible. The below table presents the data from the DOE website, the most updated data related to FTIC students at Keiser University.

Table 2. Unmet Financial Need of KU First Time-Full Time Students

Keiser University	No. of Students	Percentage
(i)Student population size	20,102	100%
(ii)Students that are eligible to receive Federal Pell Grants (First Time-Full time students)	11,860	70%
(iii)Students that receive other need-based financial aid from the Federal government, a State, or that institution (First Time students)	18,895	94%
(iv)Students that qualify as low-income consumers under 47 C.F.R Part 54 (E)	14,938	74.3%
(v) Students that are low-income individuals as defined in section 312(g) of the Higher Education Act of 1965	16,343	81.3%

The overall 4-year graduation rate at KU in 2022 was 54%, with 6-year and 8-year rates at 55% and 56%, respectively. That same year, Hispanic students had an above-average graduation rate of 62%, while the rate for African American students was lower at 45.5%. Additionally, 94% of full-time undergraduate students received financial aid (IPEDS, 2024). For the Applied Engineering program, the 4-year graduation rate was higher than the university average, reaching 68%, while the 5-year graduation rate was 75% last year. This high success rate is largely attributed to offering courses on two campuses with small class sizes, which enhances student engagement and support.

III. STEM PROGRAMS

Analysis of student data from the 2022-2023 academic year underscores a pressing concern regarding STEM retention and graduation rates. Alarmingly, a substantial proportion (31.9%) of STEM students did not maintain enrollment, opting instead to transfer out or withdraw due to factors such as academic performance, financial constraints, or other reasons. Furthermore, only a meager percentage (15.2%) of these STEM students ultimately attained graduation status. This disparity highlights a significant challenge that demands immediate attention and targeted intervention to enhance STEM student retention and promote successful graduation outcomes.

More than half of those STEM students who leave before completing their degree (55.4%) identify as underrepresented minorities. The full picture of which students began the program, graduated, or left before completing the program is shown in the table below.

Table 3. STEM Student Enrollment and Retention as a Function of Ethnicity

Ethnicity of STEM students	**Enrollment**	**%Transfer /Out**	**% Drop**
American Indian or Alaska Native	*19*	*10.53%*	*10.53%*
Asian / Pacific Islander	*41*	*2.44%*	*21.95%*
Black or African American	*353*	*5.95%*	*13.03%*
Hispanic/Latino	*611*	*6.1%*	*12.26%*
Multi-Ethnic Background	*3*	*0.00%*	*33.33%*
Native Hawaiian or Other Pacific Islander	*7*	*0.00%*	*0.00%*
Nonresident Alien	*41*	*7.32%*	*31.71%*
Two or more races	*13*	*0.00%*	*23.08%*
White	*466*	*4.51%*	*18.24%*
Unknown	*525*	*4.46%*	*11.78%*
Grand Total/Average	*2079*	*4.76%*	*15.25%*

KU offers a wide range of degrees and certificates in fields such as allied health, exercise and sport science, dietetics/nutrition, behavioral science, business/accounting, sport management, and criminal justice. While STEM has not traditionally been a primary focus, the university is increasingly expanding its offerings in biomedical sciences, computer software, information technology management, analytics, animation/game design, cybersecurity, and engineering. Currently, only 16% of the programs offered by KU are classified as STEM Designated Degree Programs.

Despite this growth, enrollment and graduation rates in STEM programs at KU remain significantly lower than those in non-STEM fields. This disparity is concerning, particularly given the projected exponential increase in STEM-related job opportunities. Current data shows that over 60% of students who initially declare a STEM major eventually switch to non-STEM fields, while approximately 20% leave school entirely.

The situation is even more pronounced among minority students, particularly Black and Latino individuals, who experience nearly double the rate of attrition compared to their white counterparts. These statistics underscore the urgent need to address systemic barriers and improve support structures for underrepresented students in STEM disciplines.

To foster STEM growth at Keiser University, it is imperative to develop new majors in emerging fields such as engineering and information technology. Additionally, creating a more inclusive and supportive environment is essential to empower all students to pursue and persist in STEM disciplines. By addressing these challenges directly, KU can play a critical role in preparing a diverse and highly skilled STEM workforce for the future.

IV. APPLIED ENGINEERING PROGRAM

Applied engineering is a broad discipline that encompasses areas such as automation, manufacturing, systems engineering, mechanical engineering, electrical engineering, and more. Depending on their specific focus, engineers can pursue various certification programs to enhance their qualifications and skills.

The current Applied Engineering (AE) program at Keiser University was designed to provide students with an entry point into the engineering field, particularly for those who may lack strong mathematical aptitude. Launched in the fall of 2018, the program follows a structured four-year format, offering introductory courses in electrical, mechanical, and computer engineering fundamentals. The program is available in both face-to-face and fully online formats. The first cohort graduated in spring 2023, and the program currently enrolls 86 students with 44 students in the fully online program and 42 attending face-face classes at the Flagship and Fort Lauderdale (FLL) campuses.

After extensive review, several concerns have been identified regarding the program's structure and content. The current curriculum lacks a specific focus and fails to align with industry standards or address the practical needs of employers hiring applied engineers. The coursework does not adequately cover core engineering principles or provide sufficient specialization to meet the demands of the field.

Furthermore, while most courses (totaling 66 credits) are designed as 4-credit courses, they lack the integration of hands-on learning experiences or lab components. This limitation significantly hinders students from developing the practical, applied skills that are essential in engineering roles. The absence of critical foundational courses in mathematics, computer science, and other core engineering disciplines further undermines students' academic preparedness and their ability to succeed in the field.

To address these issues, a more focused and industry-relevant curriculum is needed. Enhancing the program with specialized tracks, practical lab experiences, and foundational courses will ensure that graduates are better equipped to meet the real-world demands of applied engineering.

V. CURRICULUM REVISIONS

The major support for the curriculum revision and refinement of courses in the literature comes from consensus interdisciplinary research in the areas of instructional systems design, cognitive science, and cognitive psychology. A fundamental key recommendation from research in instructional systems is that in a program of study, preceding courses must provide necessary prerequisites for subsequent courses to ensure program-based cumulative learning [23]-27]. Second, research from cognitive science argues that effective meaningful learning in virtually any instructional environment is dependent upon the interaction of student prior knowledge and quality of instruction (e.g., instructional coherence/cohesiveness) [28]-[30].

This perspective is important for supporting year 1-2 students in an engineering degree program because it addresses the question of whether the core concept knowledge developed in prior courses is sufficient for students to be prepared to benefit optimally from new course-specific instruction. If not the case, then a high degree of variability in student academic success is likely to occur.

Several other research perspectives in the literature have implications or supporting the importance and critical nature of conducting an in-depth review of the key gateway and advanced courses in the engineering program sequence. In classic work, Anderson [31], [32] addressed the dynamics of cognitive skill development through processes in which declarative knowledge is transformed into procedural knowledge that, in turn, can be applied with automaticity (i.e., as expertise) [33], [34]. Pichler and his students demonstrated that the patters of the distribution learning experiences over time were of significant importance in initial mastery and subsequent retention/accessibility of cognitive skills [35]. Each of these factors is directly relevant to the importance of the curriculum revision/ course refinement component to be conducted because of its inherent impact on in-depth student learning and subsequent student success in progressing through the AE program and graduation. The following program goals have been adapted:

Goal #1 – Students will develop technical competency, critical thinking, and problem-solving skills, applying engineering principles to analyze, design, and implement creative solutions to real-world challenges using modern tools and technologies.

Goal #2 – Students will collaborate effectively in multidisciplinary teams, foster a diverse and inclusive environment, and demonstrate professionalism and strong communication skills to convey complex technical concepts to a wide range of audiences.

Goal #3 – Students will drive technological innovation and transformative change with a strong commitment to sustainability and ethical responsibility, addressing diverse user needs to benefit both local and global communities.

To achieve the above program goals, analysis of available data and institutional trends strongly advocate for a significant overhaul of the existing AE curricula to better align with ABET criteria and student learning outcomes. To address the concerns, the revised curriculum is proposed, It incorporates a more focused approach, integrating industry-relevant content that addresses the specific demands of areas such as manufacturing, automation, and technology development. This specialized focus will better prepare students for the diverse challenges of applied engineering fields. We aim to ensure that the program addresses the profession's technical and problem-solving aspects, offering specialized tracks or concentrations within the broader AE degree to alignment with industry trends. The major changes related to the programs are as follow:

- **Revision of Course Credit Structure**: Develop new courses and restructure the curriculum by replacing 4-credit courses with 3-credit courses. This adjustment will address content-related concerns, improve course alignment with academic standards, and provide greater flexibility for integrating additional topics or electives.

- **Development of New Laboratories**: Establish two state-of-the-art laboratories to bridge the gap between theoretical concepts and hands-on experience, fostering practical skill development.

- **Course Refinement**: Revise and update existing courses to align with current industry standards, address identified content gaps, and enhance learning outcomes.

- **Creation of an Undergraduate Research Course**: Introduce a dedicated research course to provide students with opportunities to explore innovative projects, develop critical thinking, and enhance problem-solving skills.

- **Expansion of the Capstone Project**: Extend the capstone project to span two semesters, allowing students more time to engage in in-depth, real-world problem-solving and project development.

- **Development of New Industry-Aligned Courses**: Design and implement new courses tailored to emerging industry trends and workforce demands, ensuring graduates are prepared for evolving challenges in applied engineering.

- **Incorporation of Certification Programs**: Integrate industry-recognized certification programs as a core component of the curriculum to enhance students' professional qualifications and career readiness.

Table 4: Key Components of Curriculum Revision

Major Program Revisions	**BRIEF DESCRIPTION**
New Courses	Development of New Courses to address the contents related matter by replacing 4 credits courses to 3 credits.
Certification Program	Development and offering of certification programs to aligned with the industries' needs(Please see details description)
Laboratory Development	Development of two Engineering laboratory (Lab I, and Lab II with details)
Capstone Engineering Design	The course is designed to introduce the concepts of innovative thinking, critical design, and teaming, through an actual design exercise. Whether as individuals or 'Teams', the Engineering students are encouraged to propose their ideas, use the design process to suggest a solution pathway, engage in implementing their research design, and present their findings/prototype to the class and broader audience. The actual teaming exercise is used not only to engage the students and help them with self-assessment but also to plant the seeds of workforce development as they see a wider set of opportunities.
Internship for Workforce	The Internship Program provides students with opportunities to: (1) explore career interests and work environments; (2) receive on-the-job training and utilize

Development and Career Readiness	technologies in the workplace (3) gain marketable skills; and (4) experience network and secure job opportunities upon graduation.
Undergraduate Research	To inspire students to be involved in undergraduate research, STEM faculty will be invited to engage students in active participation in their research areas as part of the project's plan for student professional development. A well-established model that includes student research seminars/workshops, funding support for student research, faculty mentors, and opportunities for them to present at KU spring semester research symposium will be adapted for the project

Research indicates that revising the curriculum of Keiser University's Applied Engineering (AE) program can positively impact both short-term (1-3 years and long-term (5+years) enrollment. While specific projections depend on various factors, insights from similar initiatives offer a framework for potential short-term and long-term growth. An estimated 5% to 15% short-term increase in enrollment may result from immediate interest due to new certifications, enhanced industry alignment, and targeted recruitment efforts. For instance, institutions that have introduced active learning opportunities and linked coursework to current engineering challenges have observed improvements in student engagement and retention. An estimated 20% to 40% long-term increase in enrollment is achievable as the program builds a strong reputation, employers recognize its value, and graduates secure competitive job placements. Sustained growth has been observed in programs that continuously enhance their curriculum, establish robust industry partnerships, and effectively market their unique strengths. By strategically aligning curriculum improvements with industry needs and student expectations, [University]'s AE program can achieve sustainable enrollment growth while enhancing its impact in the field of applied engineering. [48], [49].

V.2. Applied Engineering Certifications

As mentioned on the introduction section, recent statistics from the U.S. Bureau underscore a substantial need for engineers and computer science professionals over the next decade, driven by both job growth and the need to replace retiring workers. Among the occupations projected to experience the most growth by 2031 are computer and information science, as well as biomedical engineering. To address this growing demand and encourage student participation in these professions, KU must actively promote these fields among its student population. This strategic emphasis on aligning curriculum with industry demands and fostering interest in burgeoning fields is crucial to ensuring the university remains at the forefront of engineering and computer science education.

Currently, there are many certifications available for applied engineering including certified: Manufacturing Engineer (CMfgE), Automation Professional (CAP), Reliability Engineer (CRE), Quality Engineer (CQE), Six Sigma Green Belt / Black Belt, Project Management Professional (PMP), Systems Engineering Professional (CSEP), Engineering Technician (CET) and Energy Manager (CEM). To further enhance the program's appeal and provide students with measurable credentials upon completion of specific courses, we will introduce a certification system. Students can select four courses aligned with their specific interests or career goals, and upon successful completion of these courses, they will receive a certification. This allows students to gain specialized skills and improve their marketability to employers. Certification courses will be designed in collaboration with industry partners to ensure that they meet current workforce needs

There are key elements to review when considering a certification opportunity including the specific industry focus, the required level of expertise and required continuing education. Certifications in AE can significantly enhance your technical expertise, broaden your career opportunities, and make you more competitive in the job market. The best certifications for students will depend on the specific area of interest within applied engineering. The justification for two of the proposed certifications are outlined below:

Alternative Energy Certification- The certification will address the need for "*green*" workforce development, incorporating significant exposure to solar, wind, fuel cell, biofuels, geothermal, and other clean-energy-related technologies, as well as underlying foundations of designing for sustainability. In addition, the track will incorporate content related to complexity and economic issues relative to energy and environmental policy, including carbon reduction targets. Students will be made aware of the impact human activity has on the environment and how politics and business interests influence how technology is developed and delivered to the market. As the transportation sector accounts for the largest source of pollution in the United States of America according to the latest data from EPA [36]. To combat this and ease the strain on planet

Earth, many automotive companies, with government support, have announced an accelerated roll-out of electric vehicles (EVs). While Tesla currently is the most well-known and arguably most successful to date, all major legacy manufacturers, as well as several new start-ups, are looking to make a splash in this market [37]-[39].

However, it is clear that as part of the mix of energy sources necessary to deal with these challenges, alternative energy sources will play a critical or even a central role to address the demand. The US Department of Energy, as well as several national laboratories and academic institutions, have been aware of the importance of alternative energy sources for some time. Recently, the energy industry especially car manufacturers, transportation experts, and even utilities are paying attention to alternative and sustainable sources of energy for the future. The proposed certification program aims to familiarize students with the design, testing, and implementation of alternative energy technologies including equipment, software development, and testing; In addition, the efficiency of various alternative energy sources under various operating conditions and integration of these energy sources on the performance of these technologies will be addressed. The project will develop the following courses as part of the alternative energy track for the certification program:

1. ***Introduction to Sustainable Energy*** – This course provides an overview of sustainable energy sources, including solar, wind, hydro, and bioenergy. Students will explore the environmental and economic impacts of energy production and consumption while analyzing global energy policies and future trends.
2. ***Introduction to Solar Energy*** – This course covers the fundamental principles of solar energy, including photovoltaic (PV) and solar thermal systems. Students will learn about solar radiation, system components, and design considerations for residential and commercial applications. Hands-on simulations using MATLAB and Simulink will be incorporated for system modeling and analysis.
3. ***Introduction to Electrical Vehicles and Sustainability*** – This course introduces students to electric vehicle (EV) technology, including battery storage, charging infrastructure, and power electronics. Sustainability considerations such as lifecycle analysis, energy efficiency, and environmental impact will be examined. Students will use MATLAB to simulate EV performance and energy consumption.

4. ***Solar Energy and the Smart Grid*** – This course explores the integration of solar energy into modern smart grid systems. Topics include grid-tied PV systems, demand-side management, energy distribution, and grid stability. Students will use Simulink modeling to analyze smart grid operations and the role of solar energy in enhancing grid efficiency.
5. ***Introduction to Renewable Distributed Generation and Energy Storage*** – This course examines the role of distributed energy resources (DERs) in modern power systems, focusing on small-scale renewable energy generation and energy storage technologies. Topics include micro-grids, battery storage systems, and energy management strategies, with hands-on design exercises using MATLAB and Simulink.
6. ***Introduction to Fuel Cell Technology*** – This course covers the fundamentals of fuel cell operation, types, and applications in transportation and stationary power generation. Students will study hydrogen production, fuel cell thermodynamics, and efficiency analysis while using simulation tools to model fuel cell performance.

Each of the above course integrates MATLAB programming or Simulink modeling for the design and analysis components, providing students with hands-on experience in system simulation and optimization. Due to space limitations, further details have not been included here.

Artificial Intelligence (AI) Certification. The certification will integrate soft computing paradigms [40] and incorporate human expert knowledge in various emerging and complex systems. These paradigms have shown an ability to process information, adapt to changing environmental conditions, and learn from the environment. The recent surge of interest in AI stems from three converging developments. First, the increasing demand for realistic computer games led to the creation of specialized graphics processors. Second, the widespread networking of computers has resulted in the availability of massive datasets. The digitization of images, videos, audio, and text has created a fertile ground for machine learning advancements. With access to these large datasets, AI researchers were able to revisit and refine older artificial neural network models, training them on a scale previously unimaginable. The pace of advancements in AI technology has been growing at an exponential rate. For the proposed Artificial Intelligence (AI) certification, several applications-oriented and hands-on artificial intelligence simulations will be developed. These courses are designed to provide students with a strong foundation in AI techniques and their practical applications in engineering. The following courses will be included in the certification program:

1. ***Introduction to Neural Networks*** – This course introduces students to the fundamentals of artificial neural networks (ANNs), including their structure, function, and training algorithms. Topics include perceptrons, backpropagation, and network architectures. Students will learn how to implement simple neural networks for classification and regression tasks, with hands-on exercises using MATLAB’s Neural Network Toolbox. Simulations will allow students to apply neural networks to engineering problems, such as pattern recognition and data prediction.
2. ***Deep Learning*** – Building on the concepts from neural networks, this course dives into deep learning techniques, exploring multi-layer neural networks, convolutional neural networks (CNNs), and recurrent neural networks (RNNs). The course will focus on applications such as image recognition, natural language processing, and time-series forecasting. Students will use MATLAB's Deep Learning Toolbox to design, train, and evaluate deep learning models, applying them to real-world engineering datasets and projects.
3. ***Fuzzy Logic*** – This course covers the principles of fuzzy logic, a key method for handling uncertainty and imprecision in decision-making and control systems. Topics include fuzzy sets, fuzzy inference systems (FIS), and fuzzy rule-based systems. Students will explore how fuzzy logic can be applied to engineering problems such as control systems, decision support systems, and optimization tasks. MATLAB’s Fuzzy Logic Toolbox will be utilized to build and simulate fuzzy systems for various engineering applications, giving students the tools to design and implement fuzzy control systems.
4. ***Evolutionary Computation*** – This course introduces students to evolutionary algorithms, including genetic algorithms, genetic programming, and evolutionary strategies. Students will learn how these algorithms can be used for optimization, machine learning, and problem-solving tasks in engineering. MATLAB’s Global Optimization Toolbox will be used to design and run evolutionary computation simulations, applying them to real-world engineering optimization problems such as parameter tuning, structural design, and resource allocation.

5. ***Application of AI in Engineering*** – This course focuses on the integration of AI techniques into engineering applications, demonstrating how AI can solve complex problems in areas such as robotics, process optimization, predictive maintenance, and design automation. Students will work on project-oriented simulations that incorporate the AI techniques learned in the previous courses, using MATLAB to implement solutions to engineering challenges. The course will also cover case studies and industry applications, preparing students to apply AI technologies in their engineering careers.

Each course will integrate relevant MATLAB toolboxes and include specific project-oriented simulations that align with real-world engineering problems. These hands-on projects will help students gain practical experience with AI techniques and provide them with the skills necessary to implement AI solutions in engineering contexts.

V.3. Engineering Labs I &II

The proposed new laboratories (Lab I and II) will support instruction in Keiser University's current Applied Engineering program and enable the establishment AE students to have extensive hands-on experiences. Presently, there is no engineering laboratory available to any KU students. All Applied Engineering students will benefit from hands-on learning experiences provided by the laboratory instruction.

In general, the connection between theory and practice has always been one of the most difficult lessons to teach in engineering. Hands-on experience such as in a laboratory environment provides a tool to solidify concepts covered in a lecture course. The proposed project is intended to substantially improve the capability of undergraduate instruction related to recent trends and developments in emerging technologies including alternative energy, drone technology, and biotechnology. The laboratory will be used to supplement several engineering courses for the revised program as well as provide support for capstone design projects. In addition, the laboratory will provide a vehicle for the development of state-of-the-art projects for engineering students. The proposed laboratory will accomplish the following goals and objectives:

- *To familiarize the student with the design, testing, and implementation of emerging technology as desired by local industries*
- *To evaluate the effect and efficiency of the design laboratory experiments*

- *To introduce the use of test setups emerging in industrial communities, but not yet utilized in the undergraduate university environment*
- *To create a focal point for interdisciplinary learning as well as presenting a balance between theoretical and hands-on experience in undergraduate instruction*
- *To provide a vehicle for the development of undergraduate capstone projects related to emerging technologies*

A set of 4-6 workstations that act as "Data Acquisition and Control" modules and incorporate multiple sets of equipment, sensors, and data acquisition interfaces will be developed. The students will be also allowed to build their systems using spare solar panels, wind generators, drones, fuel cells, and other devices with sensors as well as monitor the operation with the onboard data acquisition system.

VI. EVALUATION

The implementation of the new curriculum is anticipated to provide a robust and comprehensive educational experience that effectively addresses industry demands while catering to the diverse needs of students. A key aspect of this evaluation process involves the provision of certification in the selected track upon completion of academic requirements. To ensure the efficacy and continuous improvement of the curriculum, rigorous evaluation procedures will be employed, guided by the Program Evaluation Standards [44]-[47]. The following Student Learning Outcomes (*SLO*)have been adapted for the programs:

SLO#1*: Technical Proficiency: Graduates will demonstrate proficiency in applying fundamental*

engineering principles and techniques to effectively analyze and solve complex real-world

problems using modern tools and technologies.

SLO#2: *Critical Thinking and Problem-Solving: Graduates will utilize critical thinking to identify, develop, and evaluate innovative solutions to complex engineering challenges, assessing*

potential risks and benefits to make informed decisions.

SLO#3*: Design and Innovation: Graduates will design and implement effective engineering*

solutions that integrate creativity, technical skills, and an understanding of constraints such as *cost, safety, and sustainability.*

<u>SLO#4</u> *. Effective Communication and Ethical Responsibility: Graduates will communicate engineering concepts and solutions clearly through written reports and presentations, while considering the ethical, social, and environmental implications of their decisions.*

A sample of SLO#1 and #2 for three level of courses are presented. Due to the space limitation, the details have not provided in this section.

Table 5: Sample of Assessment Instrument for SLO#1 and SLO #2

COURSE CLASSICATION	***SLO #1***	***SLO#2***
Introductory Courses (1* Level) -Benchmark: Pass-rate >=70%**	*Individual Assignment-. Analysis of engineering Principal and applications using Mathematical tools.*	*Individual Assignment-. Analysis and Synthesis of engineering 's Principles and their applications using software simulation.*
Second- and Third-Year Courses (2* & 3***) > Pass-rate >=75%**	*Individual Assignment- Identify an engineering problem and develop a practical approach to address the issue under consideration.*	*Individual Assignment. Apply a specific software (e.g., MATLAB, SIMULINK or PSPICE)) to model and simulate engineering applications.*
Advance Courses (4* Level) Benchmark: Pass-rate >=75%**	*Individual Assignment- Case study: Analysis and Synthesis of Engineering applications/ Products.*	*Final Project- Design an engineering product that satisfies specific criteria including environment issue and safety.*

Central to the evaluation process will be the use of valid and reliable measures to assess the utility and effectiveness of the curriculum. This approach will ensure that the program is continuously improving and effectively meeting its goals. The evaluation will be multi-faceted and will involve gathering feedback from a wide range of stakeholders, analyzing student performance data, and evaluating the alignment of course content with industry standards and best practices. Specifically, we will utilize the following evaluation methods:

Pretest and Posttest – A pretest will be administered at the beginning of each course to assess students' prior knowledge of the subject matter. A posttest will be administered at the end of the course to measure knowledge gain and learning progress. This method will help evaluate the effectiveness of the course content in fostering the intended learning outcomes. The comparison between pretest and posttest results will provide insight into the overall impact of the curriculum and identify areas where students may need additional support or resources.

Retention Rate – Retention rates will be monitored to assess student persistence throughout the program. High retention rates indicate that the curriculum is engaging and provides sufficient academic support to keep students enrolled. The retention data will be used to identify any potential barriers to student success, such as academic challenges or a lack of engagement, and will inform adjustments to teaching strategies and course delivery.

Graduation Rate – The graduation rate will be tracked to measure how many students complete the program within the expected time frame (typically four years, though some students may take longer). A high graduation rate indicates that the curriculum is effectively supporting students to achieve their academic goals. This metric will be analyzed alongside other performance indicators to determine whether curricular adjustments are needed to improve student outcomes, such as refining course content or offering additional resources for students at risk of not graduating.

Employment within Six Months of Graduation – The employment rate within six months of graduation will be assessed as a key indicator of the curriculum's alignment with industry needs. Successful employment outcomes suggest that the curriculum is equipping students with the skills, knowledge, and credentials necessary to meet industry demands. Feedback from employers and industry partners will be collected to gauge the relevance of the skills acquired during the program and to identify areas for improvement in curriculum content to better prepare students for the workforce.

By leveraging these evaluation methodologies, the curriculum will be continuously refined and improved through an iterative process. The results will provide actionable insights that help optimize learning outcomes, ensuring that the curriculum remains dynamic and responsive to both the evolving needs of students and the changing demands of the industry. This process will also enable the program to remain relevant, innovative, and aligned with current industry standards and best practices.

VII. CONCLUSION

The proposed curriculum revision for the Applied Engineering (AE) program at [University] is designed to address current challenges while positioning the program for future growth and success. By emphasizing industry alignment, foundational knowledge, hands-on learning, and certification options, the revised curriculum aims to provide a comprehensive educational experience that prepares students for the dynamic and evolving field of applied engineering. Continuous curriculum evaluation will ensure adaptability and relevance in an ever-changing global job market. This innovative approach will not only improve student engagement and success but also enhance the program's competitiveness within Florida and beyond.

A fully online Applied Engineering program offers significant advantages, including flexibility, cost savings, and access to a wide range of courses. These features make it an excellent option for students who are disciplined, self-motivated, and require flexible learning pathways. However, online delivery comes with trade-offs, particularly in providing hands-on experiences and fostering networking opportunities—both of which are critical in technical fields like engineering.

A primary measure of the revised program's success will be its graduates' ability to seamlessly transition into industry roles or graduate studies within one semester of graduation. This reflects the program's dedication to equipping students with the necessary skills, knowledge, and credentials to thrive in their careers.

To assess the long-term sustainability of [University's] Applied Engineering (AE) program, a combination of quantitative and qualitative metrics will be utilized. Key indicators include enrollment and retention rates, which track student growth, first-year retention, and graduation trends over time. Additionally, graduate employability—measured by the percentage of graduates securing jobs in the field within six months and their average starting salaries—will serve as a critical benchmark. Industry alignment**,** including partnerships and collaborations with employers, will further demonstrate the program's relevance and impact in the field.

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