1. **STEM Course Enhancement – Dakeev, Engineering Technology**
2. **PI: Ulan Dakeev, Assistant Professor, dakeev@shsu.edu**
3. **2021 STEM Course Enhancement Project (Active, 85% complete)**
4. **Budget**

   To enhance the ETEC courses with VR Robotic Arm Lab, the following items are requested:

Student Assistants	$1,200
Android Tablet	$600
Training Materials	$200
Total	$2,000

5. **Targeted course: ETEE 3313 Industrial Robotics, expected enrollment: 24 students in Spring/Fall 2022 semesters.**

6. **Project Narrative**

   STEM Center awarded us to develop VR Robotic Arm Laboratory in VR environment. Although the project is still active, we are in the final stages of collecting and analyzing data for its effectiveness. The complete project involves a student to pick up a virtual object and place in a bin via VR headset. The purpose of this proposed project is to further improve the VR Robotic Arm project, where the students will not only train their muscle memory to operate the robotic arm, but also develop robotic arm scripts. Therefore, the developed program for the VR Robotic arm will demonstrate the accuracy of the program, which can later be deployed on the physical Robotic arm. We hypothesize this will reduce laboratory time spent by the students as well as independent investigation of programming compilations prior to deploying on the physical Robotic Arm. Expected completion date of the project is November 2022 to develop and publish at a Annual ASEE (American Society for Engineering Education) Conference, June 2023.

Methodology:
We will hire one or two undergraduate students, who will be training to operate the Fanuc robotic arm, write programming functions and replicate these in the VR environment. Therefore, the test subjects would be developing programming sequences for the Robotic Arm in VR environment, test them in the VR and deploy the final product on the physical Robotic Arm.
To achieve this goal, the project targets the following two objectives:
   a) Develop 2 programming sequences from the Fanuc Robot instruction manual
   b) Test the programs in the VR environment for final accuracy
   c) Deploy the VR generated program to the physical Robotic Arm
   d) Conduct comparative analysis for mean time spent in the physical laboratory

Justification:
Although we have developed the VR Robotic Arm Laboratory for students' use, the proposed improvement will help the students develop programming for their Robotic

Arm projects. This project will involve 2 programming modules from the instruction manual for the Fanuc Robotic arm. Upon completion, we will request the Robotics professor to use in his class and provide data for our research use as well as future improvements.

Previous VR Robotic Arm Lab is submitted for the national conference, where the undergraduate students are expected to present. Additionally, they will be presenting the outcomes of this project at an undergraduate research symposium.