**Electrical and Computer Engineering (ECE) Retention Program**

**Research Mentoring Program**

*Project Outline Form*

**Faculty Supervisor/Mentor**: Dr. Shonda Bernadin

**Graduate Student Mentor**: Muhammad Fasih Waheed

**Graduate Student Mentor (optional):**

**Undergraduate Student Mentee**: Malik Lewis

**Undergraduate Student Mentee # 2**: Mekhi Connor

**PROJECT TITLE: Acoustic Sensor Arrays in 3D Printing**

**PROJECT GOALS:**

* *Familiarize yourself with 3D printer condition monitoring.*
* *Learn about acoustic array sensors.*
* *Implement an acoustic array for 3D printer condition monitoring.*

**IDENTIFY YOUR WEEKLY TASKS** *(These weekly research tasks may be tentative and thus may change throughout the semester. During your initial meeting, you should thoroughly review your project description and identify appropriate short-term tasks that can help you reach your project goal(s).)*

**WEEK 1 TASKS:**

* Learn about 3D printers.
* Learn about CAD.
* Research on acoustic sensor array and how it can be useful in 3D printer condition monitoring.
* Lab Orientation.

**WEEK 2 TASKS:**

* Safety training (CAPS)
* Define scope and check for parts if needed.
* Learn about CAD Design.
* Arduino

**WEEK 3 TASKS:**

* Working with hardware and assembly design
* Safety training continuation/completion

**WEEK 4 TASKS:**

* Learn about microphone arrays.
* Print and record audio with a single microphone.

**WEEK 5 TASKS:**

* Do research on types of microphone arrays.
* Implement two different types of arrays and compare recording results. (Circular, linear, beamforming etc.)
* Document results using friture or spectroid or any other spectrogram app.

**WEEK 6 TASKS:** Click or tap here to enter text.

**WEEK 7 TASKS:** Click or tap here to enter text.

**WEEK 8 TASKS:**

* Record sounds using a linear array.
* Record sounds using an angular array.
* Compare the differences, Observe all three waveforms using a software like friture and audacity.
* Clean out/filter the noise from the waveforms if needed.

**WEEK 9 TASKS:**

* Test and verify results
* Prepare poster presentation.
* Write the paper using the provided template.

**WEEK 10 TASKS:**

* Proofread paper and make a video presentation as guidelines suggest.
* Make any changes if necessary.

\*\* Note that the research tasks in one of the latter weeks should *be “Prepare and practice poster presentation for Research Expo”.*