**ABET Addendum to ELEC 4000 Final Report Requirements:**

As part of our ABET assessment process, each student must address outcomes (2) (4-j) and (7) in the appendix for your team’s final report. The department’s ABET outcome rubrics are provided. Note that each outcome has a series of performance indicators, and these are assessed using a rubric for the outcome.

Use the following format (without the italicized comments):

Appendix A: ABET Issues – *Nia Perkins*

**(2) Apply Design**: demonstrate 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.

a. Use knowledge, methods, processes and tools to create a design that meets stated requirements

*The goal of our project was to design, build and program a fully autonomous robot to play at that 2019 IEEE SOUTHEASTCON Hardware Competition. We successfully designed and built a robot that meet all the needed criteria for the competition.*

b. Evaluate if a design meets desired needs

*The design of our robot meets all the requirements to successfully compete in the competition, however our software was not fully implemented thus lacked the ability to compete competitively.*

c. Consider realistic constraints in the design

*Two realistic constraints came into play after the initial design of our robot was implemented. One being the field wall height and the LIDAR placement. In order for our robot to successfully localizing within the field the LIDAR must only read the field walls, initially our LIDAR was too high, and a few hardware changes had to be made. Second was the official competition field carpet color and arena lighting both have a significant affect on the vision detection.*

d. Consider public health, safety, and welfare in the design

*Our biggest safety concern was to not burn out any electrical components. Special care had to be taken to insure proper wiring was taking place as well as the correct voltages were supplied to each component.*

e. Consider global, cultural, social, environmental, and economic factors in the design

*Our robot requires two LiPo batteries a main and auxiliary. During the use of the batteries there is no significant environmental impact however when done proper measures need to be taken to dispose of correctly to not have a negative impact on the environment.*

f. Testing of the final design

*Practice runs are the only effective way of testing our system. Due to software limitations very few practice runs were able to happen.*

**(4-j) Judgement**: demonstrate an ability to make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

a. Make informed judgement

*After a visit to a auburn robotics research lab we as a team decided that the best way to tackle the world of autonomous path planning was thru the implementation of the Robot Operating system.*

b. judgement considers impact of solution in global context

*On a global standpoint of software ideally this would greatly simply coding and algorithms, as a lot of the sensors we have equipped are ROS applicable.*

c. judgement considers impact of solution in economic context

*ROS is an open-source environment, meaning there are no cost associated with the operation. However, as time went on, we discovered many of the packages required sensors to operate fully that we initially didn’t intend on using. Even more we eventually ran out of processing power as we were only using one raspberry pi which resulted in us needed two. In all a rough estimate is we spent an extra $150 trying to get the navigation stack running.*

d. judgement considers impact of solution in environmental context

*This is a software problem so one would think no environmental impacts would come into play.*

e. judgement considers impact of solution in societal context

*For a competition of this caliber the use of ROS was actually not needed, but our eager to learn gained us superiority among other competitors as we took the most challenging route.*

**(7)** **Acquire Knowledge:** demonstrate an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

a. Recognize the need to find information

*Early on we as team decided instead of building algorithms for path planning from ground up, we could us a system widely accepted in the robotics community, the Robot Operating System (ROS.) However, no one on the team had any significant experience and so began the learning.*

b. Acquire and organize outside information

*ROS is a well-documented meta-operating system however learning how to implement ROS onto a custom robot isn’t so much documented. Prying thru the large ROS wiki, various online tutorials, numerous books, even a trip to a research was the only way to learn. The process of compartmentalizing what we needed for our system was task. ROS is met to modularize the robot programming process however much of the topics build upon each other, so we really had to learn a lot more than needed to narrow down to what is needed.*

c. Assimilate and apply information

*After a few weeks we confirmed what we needed was the navigation stack, a collection of ROS nodes each playing a different role in autonomous mobility. Knowledge of the creation of a ROS workspace, nodes, publisher and listener files allowed for us to somewhat drive into the world of ROS. However, our knowledge began to hit many robots once the next level of ROS hit.*