

Senior Design Project Description

Company Name	<i>Bosch Rexroth</i>	Date Submitted	<i>06/10/2020</i>
Project Title	<i>Develop Expansion of the UNC Charlotte Engineering Senior Design Toolkit and Website – Phase 2</i> (BOSCH_TOOL2)	Planned Starting Semester	Fall 2020

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

Discipline	Number	Discipline	Number
Mechanical	3	Electrical	2
Computer		Systems	
Other ()			

Company and Project Overview:

As a global leader in drive and control technology, Bosch Rexroth supports mechanical and plant engineering challenges around the world with its cutting-edge technology and unique industry knowledge. More than 32,300 employees worldwide work on safe, efficient, intelligent and powerful solutions.

Bosch Rexroth makes a variety of products that are used by engineers to move and manipulate objects created as part of an integrated system. Some examples are linear motion products like ball screws, rails, linear bushings, actuators, hydraulic systems, electric drives/controls and aluminum structural framing. See examples below:





These products support a wide variety of demanding motion tasks - in factory automation, machinery applications and engineering or mobile applications.

This project is the continuation of two past senior design projects which developed tools to assist future senior design students carry out their projects.

Project Requirements:

The Spring 2018 UNC Charlotte Senior Design team UNCC_TOOL created a tool whose goal was to capture the learning from former student projects, so that subsequent teams would not have to “re-create the wheel”. Many of the building blocks used in Senior Design projects are common to many projects. Each new project, however, has to repeat the research to learn about the technology before it can be useful to them. The idea of UNCC_TOOL was to create a usable repository of this common building block material, so that students could learn the tool set quicker and spend more time with the creativity of their project solution and less time, repeating mundane enablement research.

UNCC_TOOL created the “UNC Charlotte Engineering Tool Kit”. This is a website that provides the structure to capture the learning about several different types of technology that are commonly used on Senior Design Projects. The team created the following website:

<https://eng-resources.uncc.edu/unccengkit/>

This is a message from the site creators:

This website was created as the end product for our senior design project. It is meant to provide quick access to information that will help you complete your own design projects as well as give you a head start on concepts that you will need to know for your future careers.

As you navigate through this website you will find that this isn't like your textbooks where all of the information is just blasted at you and becomes overwhelming. Instead, we have condensed that information into the most relevant and important pieces that you need to create the best design solution for your projects. This information is also demonstrated in several video tutorials so that you can see the concepts that you are learning here in action.

While we couldn't possibly provide you with absolutely every little nugget of information that could prove useful, it is our hope that at the very least, this will be the best place to start. If you do feel that you need more information than what we have provided, there are links to our reference material on every page so that you can continue your own research on the topic.

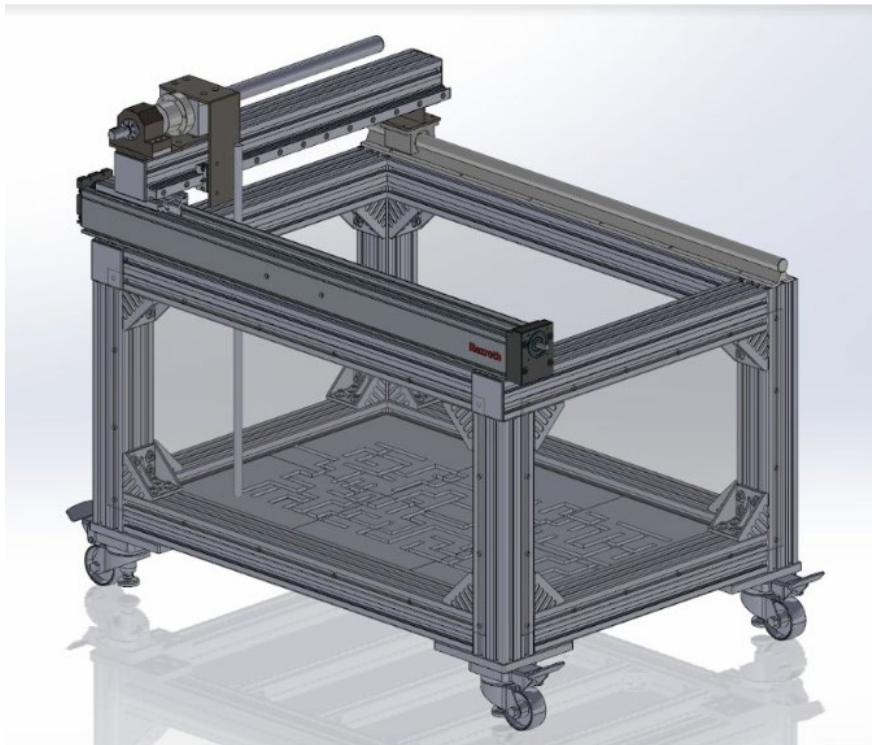
The site has sections for Mechanical, Electronics and Coding. Besides creating the structure for this website, the creators also populated the site with an initial set of information covering gears,

motors, pneumatics, bearings, belt/chain drives, sensors, PIC control and PLC's. The site provides tutorial information about each technology, covering the theory, application and practical information of engineering with these product categories. The idea for this tool is to continue to add to it, so it grows in usefulness to future UNC Charlotte Senior Design Students. The goal is that future project teams can get farther faster, by building on the work of their predecessors and focus on more innovative applications in the time that they save by using this tool.

Many Senior Design projects deal with motion, control and automation. Bosch Rexroth makes building block products that have been used in past senior design projects for linear motion, electric drives and controls, gears, hydraulics, etc. The Fall 2019 senior design project BOSCH_TOOL was supported by Bosch who provided their technical resources to expand the knowledge base of the UNC Charlotte Engineering Tool Kit. The team added content for

- Aluminum structural framing
- Profiled rail systems
- Ball screw assemblies
- Linear motion systems
- Bushings

In addition, the team designed a demonstration product which incorporated several of these technologies with the purpose of providing a physical example that future students could learn from. This product was called a "Maze Assembly":



Unfortunately, due to the Covid-19 situation, the BOSCH_TOOL team was not able to complete the build of this product.

The scope for the BOSCH_TOOL Phase 2 team will be to:

1. Complete the build for the Maze Assembly. This unit will be kept in a senior design lab for reference by future senior design students.
2. Design and build a smaller version of this unit to give to Bosch Rexroth. They plan to use this unit to take to schools for STEM fairs that they participate in.
3. Add 5 new technologies to the website using Bosch Rexroth technical support. The current Tool Kit has much more Mechanical component reference material, so the team should focus on Systems and Electronic items such as multi-axis systems, factory automation, internet of things, electrical drives, etc.

Expected Deliverables/Results:

Item 1: Maze Assembly

- Build, test and delivery working Maze assembly

Item 2: Mobile Maze Assembly

- Define specifications with Bosch Rexroth for a smaller version of the Maze Assembly
- Design, build and test a smaller version of the Maze Assembly

Item 3: Tool Kit Additions:

- Selection of Bosch Rexroth Electronic Technologies to add to the Tool Kit website
- Within each product group, develop training content for the theory and operation of the technology using BR technical resources.
- Within each product group, develop sections for the website that gives practical instruction regarding how to engineer (size, configure, control) with each product group.
- Within the project budget or willingness of Bosch to donate, take selected products and develop demonstration implementations which can be placed in Senior Design labs for future students/instructors to have hands-on training for the technology.
- Use these lab set-ups to create instructional videos for the technology applications.

Disposition of Deliverables at the End of the Project:

Material that is designed to be left in UNC Charlotte labs, should be taken to the target lab (CAB Lab) and set-up and demonstrated to the ISL Lab manager. Material that Bosch loans to the students for development purposes should be returned to Bosch after Expo. The smaller student version should be delivered to Bosch at the conclusion of the Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- Interest in Mechatronics and Automation
- Ability to develop teaching content
- Ability to take on an existing website and expand it within the current infrastructure design