

Career Exploration Report

Mechatronics & Mechanical Engineering

by Antoine Gagne, Technical Reading & Writing, DRSS

ABSTRACT

This career exploration report documents the exploration of two possible career fields and finding four possible internship sites related to those fields. In depth and detailed research was done on both career fields: Mechanical and Mechatronics engineering. Many government, informational, educational, and job description sites were used, including the US Department of Labor Statistics, HowToBecome.org and Indeed.com. This research led from information about our careers into locating four internship sites. Of these, the chosen internship was the Wright Scholar because it gives the opportunity to gain experience working in several different fields at Wright Patterson Air Force Base. Next steps would be to wait for an answer from the Wright Scholar Internship program and to conduct research on potential college programs.

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CAREER EXPLORATION REPORT

OVERVIEW

The purpose of this document is to report the research process of Antoine Gagne during his career exploration in Technical Reading and Writing at the Dayton Regional STEM School during the 2020-21 school year. The following sections document essential questions used to begin the career exploration process, potential career(s) and rationale(s) for choosing those career(s), an overview of the research process used during Antoine's career exploration, resources found and used during the process, a resolution, and a reflection of the process as well as a daily logbook of all tasks completed.

The following Driving Question was used to guide this career exploration process: How can I locate a potential internship site, college, potential career by conducting extensive independent research?

ESSENTIAL QUESTIONS

Throughout the career exploration research process, the following questions were asked:

- WHAT INDUSTRIES DOES THIS CAREER WORK IN?
- WHAT IS THE JOB OUTLOOK OF THIS CAREER?
- WHAT EDUCATION IS NEEDED FOR THIS CAREER?
- HOW MUCH EXPERIENCE IS NEEDED TO ENTER THIS CAREER?
- WHAT IS THE MEDIAN PAY FOR THIS CAREER?
- WHAT INTERNSHIPS ARE AVAILABLE IN MY LOCAL AREA?
- WHAT DOES MECHANICAL ENGINEERING LOOK LIKE IN CHINESE SPEAKING COUNTRIES?

POTENTIAL CAREERS & RATIONALES

This section provides a comprehensive list of potential future careers as well as rationale for choosing those careers.

MECHANICAL ENGINEER

Mechanical engineers are engineers that focus on designing, developing, and testing mechanical systems and mechanisms. Using simple machines such as wheels, axles, levers, screws, springs, and hinges, mechanical engineers can design and work on these mechanical systems (LiveScience). They typically work in offices but may also work on jobsites. Due to how broad mechanical engineering is, they work in a wide variety of industries, ranging from architecture, to manufacturing, and even biomedical engineering.

The Bureau of Labor Statistics reports that mechanical engineers make an average of about \$83,000 a year. Mechanical engineering is a very in demand job and has an average annual job growth of 7.91% in Ohio, with an average of 541 annual job openings (HowToBecome.org). Mechanical engineers also have a wide choice on which industry they choose to go in. Mechanical engineers are in all sorts of industry, but most work in either manufacturing or architecture.

According to Indeed.com, the first step in becoming a mechanical engineer is to obtain a bachelor's degree in mechanical engineering. If a student wants to become certified, they should go to a school with an ABET-

accredited program. Most engineers will obtain either a Bachelor's in Engineering, Science Engineering, or Mechanical Engineering. To become a mechanical engineer, there are also some skills and abilities that mechanical engineers should learn. O*NET states that mechanical engineers should understand mathematics and science and be able to listen to others, collaborate with coworkers, read information, and have very good problem-solving skills. Some other useful skills to have include critical thinking, good reading ability, and being able to apply general rules to problems they are solving.

Mechanical engineers in China are not so different to mechanical engineers in the United States. According to IBISWorld, job growth for engineering in China is expected to rise 7.6% (IBISWorld), which is not that different to Ohio's expected job growth, which is 7.9% (BLS). The tasks of engineers in China is not that different to those in the US either. Engineers in China work with CAD, design, and engineering services (IBISWorld). Mechanical engineers work in different industries in China than in the United States. Investopedia says that the biggest industry in China is manufacturing (Investopedia). This industry involves manufacturing things like iron, steel, aluminum, chemicals, toys, electronics, and plenty of other products (Investopedia). Though there is a lot of manufacturing in the United States, it is not as diverse as in China. Overall, mechanical engineers in China are not so different than engineers in the United States.

Mechanical engineering has always been an interest of mine since a young age. My father works for an aircraft landing gear manufacturing company, and I have always enjoyed seeing the manufacturing and engineering process there. Last summer, I did an internship at the company where my dad works, and I learned how to use the design program the engineer's use, how to read technical drawings for parts, and even how to measure and inspect parts to make sure they are within tolerance. Mechanical engineering is also a high demand job, meaning there is a large amount of job growth, and many options to work in. Not only is there a lot of openings, but it is also very diverse. Due to the broadness of mechanical engineering, I can choose to work in many industries, from aerospace to biomed.

POSSIBLE INTERNSHIPS FOR MECHANICAL ENGINEERING

Internships that would be beneficial for mechanical engineering are ones that involves research, design, and application of mechanical systems. This career involves a lot of hands-on experience, so any jobsite that involves working on a product or mechanical system would be useful to someone looking to gain mechanical engineering experience. Either a research or design firm could be potential options for a student. Two potential internships and their contact information is included below:

Wright Scholar Internship Program

Contact: Jeffrey Pearce (Jeffrey.pearce.2.ctr@us.af.mil)

Phone: 937-255-5015

Heroux Devtek

Contact: Frederick Gagne (fgagne@herouxdevtek.com)

Phone: 937-408-0683

MECHATRONICS ENGINEER

According to Indeed.com, mechatronics is defined as, "...an engineering field that includes many different disciplines including computer, mechanic and electronic engineering" (indeed.com). Mechatronics engineers work with not only the mechanical part of a system, but also with the software and electrical aspect of the system. Though mechatronics has grown recently, it is quite old. According to Vault.com, mechatronics is a term coined in Japan in the 1960s to talk about the integration of electronic and mechanical systems. As computers became smaller and more powerful, they found their way into these systems, leading to what we call mechatronics today. Mechatronics engineers, like mechanical engineers, work in many industries. They work as electrical designers, mechanical designers, robotics technicians, and even automation engineers.

Mechatronics has grown in relevance recently due to the increase in automation in many industries. The Pennsylvania Department of Labor has marked mechatronics as a "high priority" career (Calu.edu). Mechatronics engineers work in industries using a lot of automation, such as automotive and aerospace manufacturing. Because of this, many mechatronics engineers work as automation engineers.

The first step to become a mechatronics engineer is to obtain a bachelor's degree in mechatronics engineering (Indeed.com), mechanical engineering, robotics, or electrical engineering. The next step for mechatronics engineers is to gain experience in a similar field that they are planning to work in. After that, they must get certified. Most mechatronics engineers get a PMMI Mechatronics certification, and that is what most businesses will ask for when hiring.

Ever since I started doing robotics, I have been really interested in mechatronics. I started off doing FIRST Lego League when I was in 5th grade. Since then, I have moved up to FIRST Tech Challenge, and have been doing it since 8th grade. On my robotics team, I started off doing some of the design, then I taught myself to program the robot. Since then, I have been the lead programmer and now team captain. My time in robotics has increased my passion for robotics and mechatronics.

POSSIBLE INTERNSHIPS FOR MECHATRONICS ENGINEERING

Internships that would be beneficial for mechanical engineering are ones that involves research, design, and application of mechanical systems. Mechatronic Engineers work a lot with automation and manufacturing, so any facility that uses automation could be a good opportunity. Two potential internships and their contact information is included below:

AFRL Scholar Program

Email: AFRL-Scholars@usra.edu

Website: <https://afrlscholars.usra.edu>

Northrop Grumman

Website: https://www.internships.com/posting/sam_3742024622?context=search

RESOURCES

This section provides a list of resources found during the career exploration research process (can include resources used to explore your career fields, possible internships, etc.).

U.S. Bureau of Labor Statistics. (September 21, 2020). *Mechanical engineers*. Retrieved from <https://www.bls.gov/ooh/architecture-and-engineering/mechanical-engineers.htm#tab-1>.

- Provided information and statistics about mechanical engineers in the United States.

O*NET OnLine. (2020). *Summary report for: mechanical engineers*. Retrieved from <https://www.onetonline.org/link/summary/17-2141.00>,

- Provided information about the daily tasks and work environments of mechanical engineers.

Learn How To Become. (n.d.). *How to become a mechanical engineer: mechanical engineering degrees & careers*. Retrieved from <https://www.learnhowtobecome.org/mechanical-engineer/>,

- Provided statistics and education and job search process for mechanical engineers in the United States.

LiveScience. (August 26, 2014). *What is mechanical engineering*. Retrieved from <https://www.livescience.com/47551-mechanical-engineering.html>,

- Provided information about history of mechanical engineering, and daily tasks.

Indeed.com. (January 3, 2020). *A guide to careers in mechanical engineering*. Retrieved from <https://www.indeed.com/career-advice/finding-a-job/mechanical-engineering-career-guide>.

- Provided information about education and certification for mechanical engineers.

Indeed.com. (October 14, 2020). *What is mechatronics engineering? Definition and examples*. Retrieved from <https://www.indeed.com/career-advice/finding-a-job/what-is-mechatronics-engineering>.

- Provided explanation of mechatronics, and mechatronics in the real world.

Calu.edu. (n.d.). *What can you do with a mechatronics degree*. Retrieved from <https://www.calu.edu/academics/undergraduate/bachelors/mechatronics-engineering-technology/what-can-you-do-with-a-mechatronics-degree.aspx>.

- Gave information about demand for mechatronics and what careers you can have with a mechatronics engineer.

Vault.com. (n.d.). *Mechatronics engineers*. Retrieved from <https://www.vault.com/industries-professions/professions/m/mechatronics-engineers>.

- Gave information about the history of mechatronics and statistics.

REFLECTION

This section provides the reflection and resolution to Antoine's career exploration.

From a very young age, I have had a love for engineering. I was always fascinated by the ingenuity and creativity involved in the engineering process. I always enjoyed when I got to go to my dad's work and see the engineers at work. Another reason for choosing engineering as a career path is that it is at the forefront of technology. Engineers are always trying to reach the cutting edge and that ensures job security. Learning about mechatronics engineering also changed the way I look at engineering. Before this project, I thought of mechanical engineering, electrical engineering, and programming as separate career paths, but with mechatronics, you can work with all three. Ever since I started programming because of robotics, my interest has really grown. Due to the many fields mechatronics engineers work with, many will focus on getting a degree in either mechanical and electrical engineering, and learning the others on the job.

During the internship process, I found a very interesting opportunity. I learned about the Wright Scholar internship during a presentation about finding internships at school. This internship takes place at Wright Patterson Air Force Base and is meant for high school students. You get the chance to work at many different places and labs on base and even go through training. I have already applied to this internship, and I am waiting for a response. Overall, during this career exploration, I have learned a lot about the different career opportunities for both mechanical engineering and mechatronics engineer, and I even learned how to become one too.

LOGBOOK

The following logbook was kept during Antoine's career exploration process. It details the tasks completed during this process including sources consulted, essential questions asked and answered, as well as any other information collected each day. During this career exploration, I learned a lot about what engineering is, and even how to become one.

Date	Tasks Completed
11/6/2020	<ul style="list-style-type: none">• Researched articles for career 1 and 2.• Composed research questions.
11/9/2020	<ul style="list-style-type: none">• Found more articles for career 1 and 2.• Started annotating career articles.
11/12/2020	<ul style="list-style-type: none">• Researched and annotated articles for career 1 and 2.
11/13/2020	<ul style="list-style-type: none">• Found more articles for career 1 and 2 and finished annotating articles.
11/16/2020	<ul style="list-style-type: none">• Worked on outline for Career 1 and 2 report.
11/17/2020	<ul style="list-style-type: none">• Started writing Career 1 and 2 report from outline.
11/18/2020	<ul style="list-style-type: none">• Finished writing Career 1 and 2 reports.
11/30/2020	<ul style="list-style-type: none">• Peer Review for Career 1 and 2.
12/1/2020	<ul style="list-style-type: none">• Updated CER report based on peer review.• Wrote internship opportunity passages
12/4/2020	<ul style="list-style-type: none">• Updated Internship information• Added abstract, resources, and summary sections
12/7/2020	<ul style="list-style-type: none">• Checking capitalization in career 1 and 2 reports.• Adding reflection
12/8/2020	<ul style="list-style-type: none">• Went through polishing checklist and fixed a couple of issues.