Protection Systems Engineering

Job Description

-Protection systems engineers design and implement systems to keep people and the equipment safe at the SNS.

Education

-Bachelor's degree in an engineering field

Approximate Salary Range

-The approximate salary range for a career in protection systems engineering is about $60,000-$150,000

What can I do now to prepare?

-Enroll in advanced math and physics courses in high school

-Find universities with engineering programs that interest you and determine what qualifications you must have to get into those universities

Career Spotlight



Layla Marshall: Protection Systems Engineer

Layla Marshall is a protection systems engineer at the Spallation Neutron Source. The main objective in her field is to keep employees safe while working around the advanced equipment at SNS. Some examples of protection systems at SNS include: locking the doors into the accelerator tunnel when the beam is operational to prevent workers from being exposed to radiation hazards, alarms that sound if too low amounts of oxygen are detected in the air where people are working, and immediate beam shut down stations that can turn off the beam in case of an abnormal emergency. Layla is involved in the initial design of these systems, maintaining and troubleshooting the systems as problems arise, as well as researching to discover what upgrades could be made to make the protection systems function even better. Layla has an electrical engineering degree and specifically chose that field because after obtaining the degree there are many options for careers. Of course she could've become an electrical engineer, but the field can also lead to jobs in every aspect of modern technology including power generation, consumer electronics, and space travel. She started her career with a company that designs programable logic computers and after gaining some experience, she moved to the ORNL SNS to work as a protection systems engineer. The systems that she works with now use similar programable logic computers, so her knowledge about these computers helps in her current career. In addition to education in the engineering field, Layla finds that having good verbal and written communication skills is key in her career. Many people assume engineers have a very technical mindset and are less social than others, but Layla suggests that engineers must be able to communicate well with colleges to be successful in their jobs.

Layla Marshall

- What is your job title?

Protection Systems Engineer

- Describe your job as if you were talking to a middle schooler.

I design control systems that keep people safe while working on and around the particle accelerator. These systems are called interlocks, and they often depend on the status of the accelerator beam. One example is locking the doors into the accelerator tunnel when the beam is operational, which prevents workers from being exposed to radiation hazards. Another example is setting off alarms if too low amounts of oxygen are detected in the air where people are working, alerting them to leave the area and find safer levels of oxygen to breathe.

- Our students will build a model of the injection region of the SNS. Did you have any role in any of the equipment (design/operation/maintaining/ control) in the injection region shown in model? Can you explain that role?

The Personnel Protection System (PPS) spans the entire length of the accelerator. In the injection region of the Ring, there are multiple Beam Shutdown Stations (BSSs) on the tunnel walls to allow people working in the tunnel to quickly see the status of the tunnel and to press a button that shuts off the beam in case of an abnormal emergency. Oxygen levels are also monitored by the PPS in all segments of the tunnel to ensure workers have safe air to breathe, and the PPS will sound alarms and activate fans if too-low levels of oxygen are detected. Before people are allowed to enter the Ring portion of the tunnel to perform maintenance, the PPS turns off the power supplies to the large dipole bending magnets in the HEBT, which is the segment before the Ring. This will not allow beam to travel into the Ring segment, which protects tunnel workers from radiation exposure. The PPS also controls and monitors the status of the doors between each accelerator segment, so that if somebody enters the Ring segment when it is not safe for entry, the beam is shut down and radiation hazards are minimized.

- What qualifications or education did you need in order to be hired for your position?

I am an electrical engineer, and most people in this role are expected to have a 4-year undergraduate degree in engineering.

- Did you have any other jobs before this one that led you to your position?

I started my career working for a company that designs and manufactures programmable logic controllers (PLCs), which are the brains behind the control systems we use here in the Protection Systems Group at SNS. Knowing how to program and design PLC-based systems led me to explore jobs that use these systems, such as SNS.

- Are there any other types of jobs that work in your field that are on your team or that you work closely with?

We work closely on a regular basis with electricians, mechanical engineers, radiation safety personnel, computer aided design (CAD) designers, software developers, and operators of the accelerator.

- When did you become interested in pursuing a job in this field?

I chose engineering while I was still in high school because I enjoyed solving puzzles and learning new things in math and science classes. I decided to major in Electrical Engineering in college because it is a very broad field that can lead to jobs in every aspect of modern technology, including power generation, consumer electronics, and space travel.

- What does a typical work day look like for you?

There always seems to be something different happening every day to prevent there being a typical work day, but I find myself doing a healthy mix of computer work (reviewing and approving drawings; writing design documentation and emails to present to my team; etc.) and field work (testing our systems from the accelerator tunnel or central control room; installing locks to prevent equipment use if part of our protection system is inoperable; etc.).

- What aspects of your job do you enjoy the most?

I like being organized and leaving things in a better state than when I found them. I get to do a lot of organizing and improving in my role, and I appreciate the freedom I have as an engineer to research and implement the best solutions for the problems we're facing. I also like working as a team to accomplish goals, and I get to work with some very smart and highly qualified individuals here at Oak Ridge National Lab.

- What tools or technology do you use most in your job?

I do most of my design and programming work on laptop computers with engineering software, including Microsoft Office, AutoCAD, and Rockwell Automation PLC programming software. When troubleshooting wiring on the accelerator, I have a toolkit that includes safety glasses, ear plugs, a voltmeter, spare Ethernet cables, and screwdrivers.

- What skills (intellectual or life skills) do you think are essential in your job in order to be successful?

Most people assume engineers are technical experts and a bit less social than the average human, but I find that having excellent written and verbal communication skills is a necessity.

- Why is your job important to the Spallation Neutron Source?

Without proper attention to safety, the SNS would not be allowed to operate as an accelerator facility. My job, along with others in my group and our colleagues in other groups, protects everyone who works in and around the accelerator and ensures that they go home at the end of each day in the same health condition as when they arrived at work.