



ELECTRICAL AND COMPUTER ENGINEERING Industry Guide

Introduction

The Electrical and Computer Engineering (ECE) department at the University of British Columbia (UBC) stands as one of the university's largest academic units, boasting a substantial enrollment of undergraduate and graduate students, along with a distinguished and extensive faculty. ECE at UBC holds a prominent global position in the fields of Electrical and Computer engineering education and research.

Electrical and Computer engineers are involved in a wide array of industries, including telecommunications, renewable energy, automation, software development, robotics, and more. The applications of Electrical and Computer engineering are incredibly diverse. Consider the world around you - from your smartphone to power grids, virtually everything you encounter is influenced or directly impacted by Electrical and Computer engineering innovations!

This document is meant to provide an overview of the industries and companies that Electrical, or Computer engineers may work for. This is not a comprehensive list, as it would be impossible to fully capture all potential career paths for Electrical and Computer engineers. The descriptions of each industry provided below are also generalized!

Career paths for ECE are very broad, which is what makes it a very attractive and stable field to go into.

Differences between Electrical and Computer Engineering

Electrical engineering and Computer engineering share many similarities, they are two distinct fields. Computer Engineering is a discipline that is focused on developing computing systems. The goal of the Computer Engineering program is to develop in students an ability to design complete systems that include hardware and software elements. Computer Engineers focus not just on how Computers work but how to integrate them into larger systems.

There is a some overlap between Electrical Engineering and Computer Engineering and this overlap is typically related to the design of digital circuits and systems. Electrical Engineering is more broadly concerned with electronic devices, Electrical motors and machines, generation and transmission of electricity, communications, signal processing, and control of such systems. As you can imagine, Electrical Engineering is an incredibly vast area! A Computer engineer should understand how a transistor works and how it plays a role in digital circuits but questions related to improving the behavior of the electronics is mostly an Electrical engineering activity.

Career Paths

ENGINEERING CONSULTING

Engineering consulting is a distinct avenue where companies seek expertise to address specific Electrical and Computer engineering challenges. Specialized ECE consulting firms often possess unique patented software, cutting-edge technology, or industry-specific knowledge that positions them as invaluable resources for solving intricate engineering issues.

These consulting opportunities extend across various industries, including but not limited to telecommunications, renewable energy, software development, robotics, and consumer electronics. ECE students should be aware that their skills and knowledge are highly sought after in a range of sectors.

SOFTWARE DEVELOPMENT

As a software developer or programmer, you'll tackle complex challenges, collaborate with cross-functional teams, and continuously refine your problem-solving skills. Your work can encompass various programming languages, software frameworks, and application domains, making it a versatile and ever-evolving career path.

Pathways to this industry involve completing internship or co-op experiences, building a software development portfolio or completing certifications online.

EMBEDDED SYSTEMS

Embedded systems engineers design and develop software and hardware components for embedded systems, such as microcontrollers and microprocessors. These systems power everything from smartphones to industrial machines.

Proficiency in programming languages like C/C++ will help if deciding to pursue this area. Also, consider completing courses on real-time operating systems. Alternatively, gain some hands on experience by working in robotics or IoT (Internet of Things) projects.

MACHINE LEARNING

Machine learning engineers work with artificial intelligence and deep learning algorithms. They develop and train models for applications like recommendation systems, image recognition, and natural language processing.

To start as a ML engineer, you will need to build strong foundations in mathematics, particularly linear algebra and statistics. You can then spend time learning machine learning frameworks like TensorFlow or PyTorch. Show-off your skills later by contributing to open-source machine learning projects.

CYBERSECURITY ANALYSIS

Cybersecurity analysts protect Computer systems and networks from cyber threats. They are responsible for identifying vulnerabilities, monitoring for security breaches, and implementing security measures.

Break into this industry by gaining knowledge in network security and encryption methods. Earn certification such as the Certified Information Systems Security Professional (CISSP).

PROJECT MANAGEMENT

Project Managers lead and oversee engineering projects. They are responsible for planning, budgeting, and ensuring project goals are met.

Leadership and communication skills are important in this role. Consider project management courses or certifications. Later, seek internships in management based roles. It is highly unlikely a student would be able to secure a Project Manager role. Seeking more entry level roles such as Project Coordination or any other role that can offer valuable experience in planning, organizing tasks, and working with teams, will build the skills to become a Project Manager later in your career.



Career Paths

HARDWARE AND DESIGN ELECTRONICS

Hardware engineers specialize in crafting electronic systems and hardware components. These components are the building blocks of various devices, from smartphones and wearable technology to embedded systems and high-performance computing devices. Hardware engineers play a pivotal role in ensuring the functionality and efficiency of electronic systems.

RENEWABLE ENERGY AND POWER SYSTEMS

Renewable Energy and Power Systems engineers focus on developing sustainable energy solutions and power generation technologies. Their work is instrumental in addressing the global need for cleaner, more efficient energy sources.

Engineers in this field integrate renewable sources like solar and wind into power grids, developing energy storage solutions, & enhancement through smart grid technologies. Additionally, they improve energy conversion efficiency, design microgrids, and work on advanced technologies like electric vehicle infrastructure and energy management systems

CONTROL SYSTEMS AND ROBOTICS

Control Systems and Robotics engineers are at the forefront of designing automated systems and robotic solutions. Their work includes creating control algorithms, sensors, and actuators that enable robots and automated systems to perform tasks autonomously and with precision.

Attempt to join one of UBC's Engineering Design Teams to gain some hands-on experience with robotics. These clubs often compete in robotics competitions, which can provide valuable exposure and opportunities to apply your skills.

These Engineers can work in various industries, including manufacturing, aerospace, automotive, healthcare, and defense.

TELECOMMUNICATIONS AND NETWORKING

Professionals in the field of Telecommunications and Networking are responsible for the design, implementation, and management of communication systems. This includes everything from mobile networks and internet infrastructure to data centers and cloud computing.

Take some time to learn about network protocols, security mechanisms, and data transmission technologies. Understand how data travels through networks and the measures to secure it. Industry recognized certifications like the Cisco Certified Network Associate (CCNA) can bolster your credibility as a networking professional.

Electrical engineers in Telecommunications and Networking can work in telecommunications companies, internet service providers, tech firms, and data centers.

ASIC DESIGN

ASIC, or Application-Specific Integrated Circuit, is an industry centered around designing and manufacturing custom integrated circuits for specific applications or functions. This industry is critical for creating specialized chips for consumer electronics, medical devices, automotive systems, and more.

Engineers in ASIC design work in semiconductor companies, tech firms, consumer electronics manufacturers, automotive industry, medical device companies, and telecommunications.



Building your Portfolio

CONSUMER ELECTRONICS

- Focus on projects that demonstrate skills in PCB design, CAD modeling, and prototyping.
- Understand the full product lifecycle from design to manufacturing.

TELECOMMUNICATIONS

- Gain experience with network design and simulation software, understand signal processing, and work on projects involving RF circuit design.

AUTOMOTIVE

- Engage in automotive electronics projects, like designing sensor systems or working with automotive software like AUTOSAR. Knowledge of control systems is crucial.

POWER AND ENERGY

- Work on projects that showcase skills in power system analysis and design, renewable energy systems, and smart grid technologies.

SEMICONDUCTOR INDUSTRY

- Highlight experience with semiconductor fabrication processes, VLSI design, or work with EDA tools like Cadence or Synopsys.

ROBOTICS AND AUTOMATION

- Build a portfolio with robotics projects, including programming robots or designing automated systems.
- Experience with microcontrollers & PLCs is advantageous.

HEALTHCARE TECHNOLOGY

- Undertake projects related to medical devices, such as designing wearable health monitors or working with medical imaging technology.

SOFTWARE ENGINEERING

- Contribute to open-source projects, develop your software applications, or showcase proficiency in different programming languages and development methodologies.

AI AND MACHINE LEARNING

- Include projects that demonstrate your AI and ML skills, such as data analysis, neural networks, or natural language processing.

ASIC DESIGN

- Present work on digital design projects, understanding of ASIC design flow, and familiarity with HDL languages like Verilog or VHDL.

FIRMWARE ENGINEERING

- Share firmware coding projects, understanding of low-level programming in C/C++, and experience interfacing with hardware.

From software development to renewable energy, your path is diverse and ever-evolving. Engage in research, internships, and networking, and stay current with industry trends. Your ECE journey isn't just about a degree; it's about becoming an innovator and leader.

As you move forward, embrace challenges, fuel your passion, and remain open to possibilities.

