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Electrical engineering fundamentals pdf

Master's degrees allow engineers to dive deeper into a technical specialty, while also broadening their knowledge in the field. The number of graduate students who have earned master's degrees in the last two decades alone has more than doubled, according to the U.S. Census Bureau. A master's degree is also a great predictor of job security, with the BLS reporting that the unemployment rate for professionals with a master's degree is lower than the national rate. The value of a graduate-level engineering degree is especially great for computer and electrical engineers, where there is strong industry demand for well-trained professionals with knowledge of both traditional and emerging topics in the field. In a profession that prides itself on high performance, computer and electrical engineering employers are looking for candidates with a potent combination of technical, problem-solving, and communication.. In this post, we'll focus specifically on opportunities unlocked through pursuing a master's degree in electrical and computer engineering. Choosing a Master's in Electrical and Computer Engineering (ECE) While an electrical engineering graduate program offers a broad view of specializations, an electrical and computer engineering master's degree unlocks additional focus areas and subsequently job opportunities related to those skills. For example, in Purdue's electrical and computer engineering master's degree, students have the option to specifically focus on computer engineering and learn about the full computing stack. Tech company giants and modern companies in domains such as healthcare, national security, space research, and more rely on engineers who understand the software and hardware you'll learn to design and build in programs like Purdue's. An Uptick in Graduate Enrollments and Self-Investment Graduate enrollment, especially when it comes to online master programs, is an important driver of higher education enrollment. That seems to have only intensified in the wake of the COVID-19 pandemic, according to a recent trends analysis by the Chronicle of Higher Education. Early- and mid-career professionals became online students because they "were able to continue working, often from home, and maybe even found themselves with a little more free time." That mindset is evidenced by some of the students in the Purdue program, who sought to achieve their learning goals through a flexible degree program, prioritizing access to quality coursework and national reputation or esteem of the school, program, and faculty over a full on-campus experience. Evaluating Flexible Degree Programs: One Engineer's Experience Take recent grad Roger Alford, who completed Purdue University's electrical and computer engineering master's degree in December 2020. He knew what he wanted–an online program that would work around his full-time job and family obligations–and did extensive research to find the program that best fit his needs. "I evaluated every online program available at the time and found Purdue to have one of the best," said Alford. "It was well established, well organized, had many excellent course offerings, and had a good selection of concentrations to choose from. These features, combined with Purdue's deeply rooted reputation for engineering excellence, made it the clear choice for me." One of the program features that stood out for Alford, who works with a team of engineers to develop life-sustaining medical devices, was the Purdue ECE program's embrace of modular learning. Through one-credit course offerings, students can broaden their exposure to different disciplines and focus on addressing key knowledge gaps. Both Specializing and Broadening Knowledge Computer and electrical engineers considering whether to earn a master of science need to have a bachelor's degree and are likely to have an educational background focused in math or engineering. Some prospective students may have just started their careers and want to develop a specialty, which can range from aerospace to electronics and photonics; from signal processing to computer science and computer systems. Other professionals pursuing a master's in computer and electrical engineering may be more seasoned veterans of the electrical engineering field or mechanical engineering. Some are experts in their field and looking to broaden their expertise or refresh skills. Others are looking to make a change or transition from their existing skill set. Still more–or likely all of the above– are lifelong learners who are passionate about learning new things. Areas of specialization within Purdue's MSECE include: Automatic Control Communications, Networking, Signal and Image Processing Computer Engineering Fields and Optics Microelectronics & Nanotechnology Power and Energy Systems VLSI and Circuit Design Purdue ECE continues to develop new courses for online learners in emerging areas, including data mining, embedded systems, and quantum technologies. The Financial Benefits of Computer and Electrical Engineering Master's Degrees Computer and electrical engineers are among the highest paying job roles in the engineering field. According to the Bureau of Labor Statistics (BLS), the median salary for electrical engineers in 2019 was $98,530, with higher salaries exceeding $155,000. Larger companies that employ large numbers of computer and electrical engineers, such as Apple, Lockheed Martin, and Microsoft, tend to pay the highest, according to the IEEE-USA 2018 Salary and Benefits Survey Report. Sector and specialization also matters, the report found, with defense-related companies and private industry leading the way with median pay of around $153,000. Yet even those making lower-end salaries in civic-oriented sectors like education or local government can still earn nearly $120,000. The bottom line is that computer and electrical engineering will continue to play a critical role in almost every facet of our society and the global economy. The need to research, develop, and implement cutting-edge solutions and technologies is a major priority for organizations big and small, and computer and electrical engineers will be the people driving many of these innovations forward. So, is a Master's Degree in Electrical and Computer Engineering Worth It? Without question, earning a graduate degree is widely recognized as one of the best ways to invest in your own development as a professional. Completing the degree isn't easy. It requires some prerequisites in math and engineering and a commitment to learning rigorous advanced-degree content. But for many prospective students, the benefits are as much about self-improvement as anything else. Alford, a principal staff scientist at Terumo Cardiovascular Group and Purdue MSECE graduate, he saw how "every course has helped me become a better engineer." To learn more about whether an electrical and computer engineering master's degree is right for you, start by exploring Purdue's 100% online, top-ranked master's degree in electrical and computer engineering. Are you interested in learning about your career options with an electrical engineering degree? If you currently hold a degree in the field, there are a variety of different, in-demand positions that you could qualify for. Electrical engineers can work in many different public and private settings, from a manufacturing facility to an industrial plant. This is primarily due to the fact that engineers specialize in designing, developing, and testing electrical devices, and electricity plays an important role in virtually all industries. If you want to scope out your options, here are some in-demand career options that you should consider: Research Engineers Research engineers may work for corporations who develop products, but they more commonly work in the labs of scientific research and development firms. If you're a creative scientist with a great deal of patience, this may be a good choice for you. A research engineer works with a team of other specialists to develop new electrical devices, test existing devices, and design better overall products during the discovery stage of product development. Design Engineers After a team of research engineers has invented a new product, the models and simulations are passed on to design engineers. These electrical engineers are responsible for turning the models and simulations constructed by the research team into an actual, mass-producible product. Electronics have several tiny parts that must work together, and the design team is responsible for the internal design layout so that these separate parts function together. Project Engineers If you have strong leadership qualities, you may want to consider becoming a project engineer. After you gain experience in the field, you can land a position where you will be in charge of overseeing research and design teams who have been assigned to develop a new technology or prototype. Project engineers need to motivate teams, make recommendations, and lead the team. They also need to demonstrate their proficiency in the field. Test Engineers A test engineer's job is to troubleshoot a device when it is not functioning properly. If something goes wrong, the test engineer will be responsible for identifying the problem and finding solutions to ensure the technology functions properly in the future. This job requires you to spend long hours performing routine tests, which means that you need to be able to stay focused for long periods of time. As you can see, electrical engineering is not a limited career field. With many different professionals needed at various stages in product development and testing, there is a place for every electrical engineer. Decide what position you would enjoy most, reach the level of education you need to pursue that position, and do what you can to become a valuable asset in a growing field. Electrical engineers are involved in design and problem solving in the field of electronics. They work in many areas including health, computing and communications [source: Princeton]. If you're considering a career in electrical engineering you will need to do well in math and science while in high school [source: BLS, College Board]. Here's what to do to become an electrical engineer.Earn a bachelor's degree in engineering with a major in electrical engineering. There is also the option to complete a two or four year program in engineering technology. Those who complete a four-year program will obtain a qualification regarded as equivalent to a bachelor's degree. If you study in a four-year non-degree course your coursework will be more practical, while if you study in a degree program your coursework will include more courses in the theoretical side of electrical engineering. As an electrical engineer major you will learn all about electricity, including how it works, how it's used to provide power and how to design electric power plants. Make sure the institution at which you study is accredited by the Accreditation Board for Engineering and Technology (ABET). This will be important if you later need to be licensed as an engineer.Get experience by working as an apprentice under an electrical engineer.Get licensed by the state in which you wish to work. This is especially important if you wish to work directly with the public. In order to be licensed you will need to be a graduate of a program accredited by the Accreditation Board for Engineering and Technology as well as having four years of appropriate work experience. You will also need to pass a state examination to get your license.Keep up with the latest advances in technology by continuing to take courses in the areas relevant to your work [source: BLS]. If you've ever flipped a light switch, commuted to work or had an MRI, credit electrical engineers for improving your life. Electrical engineers design components that make power plants, cars, medical devices and computers run. Their role in consumer electronics gives electrical engineers many responsibilities. People who can handle the job's scientific rigors earn above-average incomes. The median annual salary for electrical engineers was $85,920 as of May 2011, according to the U.S. Bureau of Labor Statistics. An electrical engineer's job starts with product or project design. Engineers choose research methods to apply electrical theory to a new device or circuit. They also use computer-assisted design software to draw a blueprint with product specifications, including calculations that lay out manufacturing and installation standards to ensure the product meets codes and client requirements. Electrical engineers oversee product development. They test a prototype of the device or circuit and use the results to order materials and equipment to build the final product or project. Plus, they make calculations to set manufacturing or installation standards. During manufacturing, engineers make sure the built product meets specifications or codes. They also monitor the manufacturing or building for cost overruns. Electrical engineers frequently interact with others on the job. They test and implement products alongside project managers to make sure projects happen on time and within budget. In addition, they work with customers or the public to investigate complaints about products. So, they evaluate customer concerns and recommend fixes for those issues. To come up with new ideas for engineering projects or products, they meet and share ideas with engineers and clients. The products electrical engineers design can harm consumers if they're improperly planned or built. That means electrical engineers have a responsibility to make ethical decisions. Electrical engineers must make honest and realistic claims about their research findings, and immediately disclose issues that could endanger the public or the environment. They have a duty to take on only projects that their training qualifies them to handle, and to inform employers or clients of their professional limitations. Taking and using constructive criticism is part of the job as well. Also, electrical engineers have a duty to help colleagues with professional development. Electrical engineers work in a variety of settings. According to the U.S. Bureau of Labor Statistics, 22 percent of electrical and electronics engineers worked for architectural or engineering consulting firms in 2010. Ten percent were employed with manufacturers of navigational, measuring, medical and control instruments, and another 10 percent worked in electric power generation, transmission and distribution. Job titles include design engineer, quality control engineer, reliability engineer, test engineer and process and manufacturing engineer. Electrical engineers typically need postsecondary education. Numbers from the U.S. Department of Labor showed that 13 percent of electrical engineers had an associate's degree as of 2011, while 73 percent held a bachelor's degree. Another 10 percent had a master's degree. Electrical engineering majors learn to apply math and science to solving engineering problems, and to design and conduct experiments. Coursework includes chemistry, physics, analytical calculus, social and behavioral sciences, electronic circuits and signals and systems.