Electrical and Computer Engineering:

Exciting Paths, Exciting Challenges and

Rewarding Careers[*]

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Electrical and Computer engineers (ECE) touch everybody's life every day. Look around as you read this. Electricity powers the light above you – and a more efficient and environmentally friendly smart grid will soon deliver it. You sit in a comfortable house where instruments and tiny computers monitor and carefully control the temperature, and a computer system initiates your automatic fuel delivery. Earlier today, you wirelessly surfed the Internet in a neighborhood coffee shop or as you walked down the street guided by your GPS. Later today, you will visit a friend in the hospital where new sensors, diagnostic tools, and instrumentation save lives. All this and more is the realm of electrical and computer engineers.

To the question, "What do electrical and computer engineers do?" The quick answer is: *all kinds of fascinating stuff*. We're *the* problem solvers. We make life more comfortable. We make the environment friendlier. Electrical and computer engineering degrees open limitless career paths. There are a myriad of technologies, industries to work in, and these jobs cover areas that are all fun, all-challenging, and, at the same time, all offer great career potentials.

What are some of the major areas of technology where the ECEs would contribute their best? The IEEE currently has over three dozen societies, representing every facet of the profession. A brief overview of what electrical and computer engineers do includes investigation and innovation in these technologies:

- *Chips and Solid-State Systems.* New chip technologies, that means new chips, and novel ways of producing them as we move fast toward nanotechnology and even more cost effective components and systems.
- *Computers and Intelligent Systems.* New computer systems, software systems, and intelligent systems to meet society's needs at ever decreasing costs.

- *Environmental Systems.* The electrical and computer engineering aspects of environmental solutions. Remember, engineers are the ones who are going to figure out and implement the solutions to the world's pressing environmental issues.

- *Medical Electronics.* The electrical and computer aspects of healthcare systems. ECE graduates play a key role in medical diagnostics and equipment.

- *Power Systems and Devices.* All aspects of power generation, transmission, and large machinery. Alternative energy, such as that from wind and ocean waves, are the key new areas of interest in addition to that of the readily managed smart grid that offers significant energy savings.

- *Telecommunications and Networks.* All forms of communications – wired and wireless, using technologies ranging from copper and fiber optic cables, microwave, and satellite to name a few. Design and development of new network components, new technologies like Wi-Fi leading to even revitalization of the entire global telecom network using the newer technologies. Some engineers can also work for major corporations to keep their large and complex networks up and running.

- And there are many other technologies you can specialize in.

Next, consider the diverse industries which may use your talents. For example:

- *Aerospace and Electronic Systems.* A novel system that could guide newer aircrafts. The existing flying machines are chock full of all types of electronic systems that use most every technology in the realm of the ECEs

- *Biomedical.* A new artificial organ, new low-cost and less invasive sensors to monitor critical functions, or an intelligent system that would revolutionize medical data analysis and healthcare information systems.

- *Computers and Software.* A new computer architecture or an improvement of an existing one, a supercomputer, or even a new software to control tomorrow's smart grid that is managed by these new computers.

- *Control and Sensors.* More effective algorithms to control tomorrow's smart grid and better guidance for the software engineer who writes the codes, or new sensors for inflatable space stations.

- *Electronics/microelectronics.* Design of tomorrow's chips and development of new semiconductor fabrication techniques. Or, move from today's chip design methods to tomorrow's nanotechnology.

- *Power.* New processes to monitor and control generation, distribution, and use of electrical energy for a greener world. Or, research into new alternate forms of power generation.
- *Telecommunications and Signal Processing.* You could develop the next smart phone or be the one who can think of new apps for these phones. You could also develop new wireless broadband access technology to economically reach rural areas, or a new algorithm to better detect low power signals – whether Wi-Fi or signals coming from outer space.

Many types of work are available within these technologies and industries. A brief overview of what people do in a few of these areas includes:

- *Consulting.* Consultants give professional or expert advice to others as needed, usually on a short-term basis. Consultants usually are experts in their fields with many years' experience.
- *Development.* Developers take researchers' ideas and make useable products. These products can be computers, electrical generators, monitors, routers, and software.
- *Entrepreneur.* Entrepreneurs start with an idea and grow it into their own business in the electrical and computer area. Take a good idea, add funding and a large measure of hard work, and success is achievable.
- *Intellectual Property and Patent Law.* Patent lawyers work with researchers and developers to write the patents necessary for engineers to receive the financial rewards of their most creative work. An ECE degree is an almost required foundation for being a successful patent lawyer in the areas of electrical and computer engineering.
- *Management.* Managers are the corporate leaders and technical management is a specialized area. An ECE degree coupled with an MBA is key to success in managing technical companies.
- *Research.* Researchers, usually at university or corporate labs, develop the science that is the basis of tomorrow's technologies and products.
- *Sales.* Marketing and sales persons deliver technology products to users. To intelligently and effectively sell electrical or computer products almost requires an ECE degree.
- *Teach.* Good teachers ensure that the profession carries on with its valued contribution to the society . Whether at the community college or university level, it's a rewarding career. Frequently, teaching is combined with research and consulting.

These work areas give rise to using an ECE degree as a stepping-stone. Combined with an MBA, ECE grads are great technology managers. Combined with a law degree ECE grads are great IP attorneys, and combined a health sciences degree ECE grads are great research physicians.

And within all areas, electrical and computer engineers also must answer the question, What are the social impacts of these technologies?

These are but a few of the options an ECE degree opens -- there are many more. All are reasons why ECE has more students than any other engineering field and our professional society, the IEEE, is the largest professional society in the world though many begin their careers in one ECE area and move to others as interests change.

Importantly, engineering isn't just for guys anymore. That stereotype has been banished. More and more women who enjoy math and science study electrical and computer engineering and are rewarded with exciting, challenging, and high paying careers. Supporting them in school and their careers is the IEEE Women in Engineering Society (WIE) with groups throughout the United States, including many university campuses. The IEEE WIE is the largest international professional organization dedicated to promoting women engineers and scientists.

What does it take to succeed in an EE or CS program? First, an interest in what makes things tick. Secondly, an interest in science and math along with a good background in these subjects. Have more questions about a career in electrical or computer engineering? Email me, ron@ronaldobrownconsulting.com. I would like to hear from you.

Electrical and computer engineers have a myriad of opportunities. They affect every aspect of life. They are real solvers of problems facing our society today. If you're thinking of a career, if you want to part of the solution, think electrical and computer engineering. It's a great ride!

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