Engineering

Engineering can be defined as the putting together of things.

(Internet source, What is engineering?) This definition has summarized a profession that dates back to ancient times. Many things have been accomplished by early engineers. The great pyramids in Egypt for example are an engineering marvel still today. The massive structures look simple but they took great skill to construct. The complex ventilation systems and rooms took brilliant engineers to design.

The people in that era had very few tools to help them build the pyramids so engineers had to devise a way to lift the ponderous stones and place them where they were needed. Engineering has many applications, and is one of the most widely used and needed professions in the world.

The building of the great pyramids is just one small facet of engineering. Engineering is not one broad profession but is a profession consisting of several specialized branches. Historically, engineering can be divided into four primary disciplines. These are civil, mechanical, chemical, and electrical engineering.

Additionally engineering is a cornerstone of nuclear technology, mining, and environmental control. Each of the four primary disciplines have a long and rich history. Civil engineering is the oldest of the four disciplines. It involves the construction and design of all types of structures and facilities. The construction of bridges, road, canals, airfields, buildings, and tunnels are all structures which require the skills of a civil engineer.

Most projects involving a civil engineer are for public use. Civil engineering can be broken down even further into fields such as structural engineering, sanitary engineering, and irrigation engineering. More recent specializations include municipal and traffic engineering. In many ways civil engineering has not changed as far as buildings and structures are concerned. The Romans were one of the first peoples to include massive construction and complex transportation systems into their daily life. The Roman people used the knowledge of civil engineering to construct the first paved roads, aqueducts, sewage systems, and ports for ships.

Incredibly, they accomplished these feats without the aid of machines or modern technology. These facilities were as impressive then as They are now. Many of them have withstood the test of time and are in existence even today. The second discipline is Mechanical engineering. It is based upon the inventions of the early 19th century. It involves the testing of all types of industry machines and engines.

This field of study is concerned with the design and development of all things mechanical. There a several subdisciplines such as agricultural engineering, automotive engineering, and marine engineering among others. Without the expertise of people involved in this highly skilled branch of engineering, we would be experiencing a more primitive and difficult way of life. Mechanical engineering along with civil engineering provide society with a better standard of living.

Mechanical engineering evolved many centuries after civil engineering. Its roots are imbedded with the advent of the Industrial Revolution. Mechanical

engineering is a direct offshoot of the Industrial Revolution. With inventions of machines such as the steam engine and the locomotive, there became a need for an advanced field to develop and produce new and complex machines. The newest of the four main engineering disciplines is chemical engineering. This is a field involving the conversion of fossil fuels such as oil and petroleum into products we use in our everyday life.

This branch of engineering deals with the design of equipment and processes concerned with the manufacturing of oil-derived products by means of harnessing the power of chemical reactions. Chemical engineering is different from other classes of engineering because it makes use of a third science that the other three lack. This is the science of chemistry. This highly scientific field is also based upon the laws physics and fundamental rules of mathematics.

With the invention of the internal combustion engine, created by mechanical engineers, a need developed for experts to deal with the chemicals involved with the operations of such machines. It was in this time period that chemical engineering made its place among the other engineering fields. Although chemical engineering is relatively young, it is a recognized profession. Its first founders and creators lived a century ago.

People have experimented with chemicals for hundreds of years but they were sometimes labeled as witches or demons. Those years are in the past now and chemical engineers are some the most respected people in the field of engineering. The fourth discipline is Electrical engineering. Electrical engineering covers the design, installation, and maintenance of electrical

systems. Electrical engineering is the largest and most diverse field of engineering.

This fourth discipline relies on electricity and the energy produced by it. Electrical engineers have created some of the most popular inventions of modern times. They have invented the television, computer, robotics, radar, lasers, and telecommunications. Electrical engineering evolved during the latter part of the 19th century. The increasing availability of electricity to the public stimulated the technology used by electrical engineers. Electrical engineering doesnt have a long history like some other fields because it could not exist without electricity.

The pioneers of this discipline include Thomas Edison and Albert Einstein. Without such radical thinkers, electrical engineers might not exist today. There are several specialties included in the diverse field of electrical engineering. This discipline can be divided into four branches: electric power and machinery, electronics, communications and control, and computers. The field that captures my interest is an offshoot of electrical engineering.

Computer engineering is a more recent specialty stemming from electrical engineering. This field, virtually unknown just a few decades ago, is now among the most rapidly growing fields of study. This division of engineering involves the design and manufacture of memory systems, central processing units, and peripheral devices. Computers are becoming as common as televisions in peoples households. The need for a computer is growing and so is the ability of computer engineers to meet those needs.

Computers are becoming an integral part of everyday life. Newer technology is allowing computer engineers to become more proficient in the way they design and manufacture computers.

Computers are able to make extremely large calculations and do the most complex of math problems. Possibly the largest single calculation was accomplished by physicists at IBM in 1995 solving one million trillion mathematical problems by continuously running 448 computers for two years to demonstrate the existence of a previously hypothetical subatomic particle called a glueball.

(Encarta 97 Computer Timothy Law Snyder pg. 3) Now computer engineers are developing ways to make calculations one hundred times faster. With the development of newer and faster computers, comes the creation of an easier and more comfortable standard of life. The history of computing began with an analog machine created in 1623 by German scientist Wilhelm Schikard.

His invention used 11 complete and 6 incomplete sprocketed wheels that could add, multiply, and divide. Another scientist, Blaise Pascal, invented a machine in 1642 that added and subtracted without outside assistance. Later, a German mathematician, Gottfried Leibniz, enabled multiplication on Pascals machine. In the early 19th century a French inventor, Joseph-Marie Jacquard, devised a loom that was a specialized type of computer. His machine punched cards to program patterns that made woven fabrics by the loom.

His looms are still used today, especially in the manufacture of fine furniture fabrics.

The first mechanical computer that had the capacity to use decimal points was designed in the 1820s by British scientist Charles Babbage. He never built his machine, but it was the first computer to have a 20 decimal capacity. He had plans for another machine, called the Analytical Engine, which could efficiently perform all arithmetic operations. Babbage never built this machine due to a lack of funds. Although never completed, the Analytical Engine used concepts such as the capacity to store instructions, primitive memory, and the ability to print, can be found in many modern computers.

Herman Hollerith, an American inventor, combined punched cards with devices that created and electronically read the cards. His Tabulating Machine Company eventually merged with other companies in 1924 to become IBM. American mathematician, Howard Aiken, developed the Mark I calculating machine, which was built by IBM. This was the first calculating machine that replaced mechanical components with ones using relays and electromagnetic ones.

Later on, Aiken used vacuum tubes and the solid state transistors to manipulate binary numbers. He also helped to establish the first computer science program at Harvard University. In 1945, Hungarian-American, John von Neumann developed one of the first computers to be used to solve problems in a variety of fields. His Electronic Discrete Variable Computer was the first electronic computer to use a program stored entirely within its

memory. In 1945 John Mauchley, an American physicist, proposed andelectronic digital computer, called the Electronic Numerical Integrator And Computer. His invention is regarded as the first successful, general digital computer.

It had a weight of more than 60, 000 lb.. and contained more than 2, 000 vacuum tubes. It required high maintenance and was used mainly for military purposes. In 1948, at Bell Telephone Laboratories, Walter Houser Brattain, John Bardeen, and William Bradford Shockley invented the transistor.

This device can act as an electric switch. This invention had a tremendous impact on computer design because it made costly unreliable vacuum tubes obsolete. In the late 1960s integrated circuits changed the field of computer engineering. Integrated circuits are tiny transistors and other electrical components arranged on a single silicon chip. Future refinements and breakthroughs in the world of computing led to the development of the modern microprocessor.

Now modern microprocessors contain as many as ten million transistors. Computer companies used this new technology to build smaller and cheaper computers. This allowed for the creation of personal computers. These computers were small enough to fit on a desktop yet powerful enough to run many types of software.

The first of these personal computers (PCs) was built in 1975 by Instrumentation Telemetry Systems. This computer, name the Altair 8800, used an 8-bit Intel 8080 microprocessor, had 256 bytes of RAM, received

input through switches on the front panel, and displayed output on rows of light-emitting diodes. With better technology came better computers. The PC continued to advance with the inclusion of video displays, better storage devices, and improved computational abilities.

Today the development of sophisticated operating systems such as Windows 95 and Unix enables computer user to run programs and manipulate data in ways that were unimaginable fifty ago. There are not many individual fields in computer engineering. A computer engineer can, however, specialize in a variety of departments such as hardware, software, or different types of computers. Computer science is the only significant class related to computer engineering.

People involved in computer science face the task of making computers more intelligent, through the creation of sophisticated programs or development of higher level machine languages or other means. In order to make the computer more intelligent, the engineer must posses excellent cognitive skills. According to Richard Olsen of Southwestern Bell grades and work ethic are important. My advice would be to make good grades.

I know for a fact that good big corporations only will hire the students with the top grades. And they will pay more for those with good grades… After you get to work your salary depends on how you perform, not what your college grades were.

But grades are an indication of your intelligence and your work ethic. And what else is there to measure you by? Grades are the only yardstick the employer has to judge your worth.

Also, engineering requires good math and science skills and knowledge. So I would concentrate in those areas. But social skills are alsoimportant. Another thing that will help you to get a good job is to find work in a technical area during the summer.

If you are in computer engineering, try to get a job at the local computer store or something. Even if you deliver stuff or just clean up you will get paid just as much as at a fast food place and you'll eventually work up to do some light technical work. In the mean time you'll be around the equipment and just seeing it and knowing what it is and hearing about it and what it's called is of some value. (Richard Olsen Personal interview).

Computer engineers must also possess the desire to transform the theoretical into the practical. They need an interest in figuring out new ways to do things. Ability to be analytical and creative. High ability to learn and understand theory and principles of engineering; to communicate both verbally and in writing; to visualized spatial relationships; and to pay attention to detail when drawing designs and specifications. (Eureka n.

p.) Engineers need to be able to analyze problems systematically and logically and to communicate well – both orally and in writing. They should be willing to work within strict budgets and meet tight deadlines. In addition, skill in directing and supervising other workers is an important part of many engineering jobs.

(Engineering World Book Encyclopedia pg. 289)Computer engineering is not a profession in which you advance to a higher position when you have fulfilled a certain criteria. You must prove yourself to be better than you

once were and have the capabilities to understand and solve more complex problems. In Richard Olsens experience: A computer engineer who is just starting out, and has good grades, can make between forty and forty-five thousand dollars a year. When the engineer becomes more experienced, they can make upwards of fifty to sixty thousand dollars a year. The most experienced engineers salary tops out at about eighty to ninety thousand dollars a year.

(Richard Olsen, Personal interview). In addition to providing a good income, computer engineering can be a very fulfilling field. There are a lot of positive benefits from becoming a computer engineer. Most people who become engineers enjoy their work a great deal. Its always good to get paid for work that you enjoy.

Plus youll always have a job because there will always be a need for computer engineers. Although there are many positive sides of computer engineering, there are a few negative ones too. For example, if you want to move into a higher paying job, you might be forced to leave the actual hands-on engineering work. If you want more money you might have to move into supervision of other engineers or move into another executive position.

All together there really arent many negative aspects of becoming a computer engineer. There are many professions that put knowledge together for some purpose. Physicians need knowledge of biology and physiology to understand the human body, coaches need knowledge of anatomy and human performance to train athletes, and attorneys need knowledge of the

law to practice. Engineering is unique from other professions because Engineering is the profession in which a knowledge of the mathematics and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize, economically, the materials and forces of nature for the benefit of mankind.

(Internet Source, What is engineering?)