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Chapter 1 : Technical books online

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General Electric GE has a real spending problem. A weakening demand for energy-related products like gas turbines and oilfield equipment dampens hope for a turnaround. Investors are now wondering, how bad can this get? General Electric was founded in by the pioneer of American electrical engineering, Thomas Alva Edison, and his partner the banker financier J. The American golden child GE represents the height of American business. Katharine Burr Blodgett, the first female scientist hired by GE, invented the non-reflective glass that is used in cameras today. GE built a large portion of the American economy, expanding across industries with the grit and moxie American companies pride themselves on. Functioning as the financial services unit for GE it finances GE customers buying products like jet engines, industrial equipment, power turbines and medical machines. But under Jack Welch GE Capital amassed a portfolio of highly specific assets, financing everything from Mexican warehouses to condos, to leasing railcars and fleets, all of which came to a head during the financial crisis. But they wanted it to be bigger Responding to pressure from investors, Jack Welch expanded GE Capital, making it the largest issuer of commercial paper in the world, incurring debt to invest beyond their means. In , Welch received the largest retirement package in history. General Electric to cut 12, jobs During his tenure, it was not uncommong for Immelt to take company aircrafts to business meetings, often having an empty jet follow behind, just in case. The , crisis marked a point when GE had to make some big decisions. Rana Faroohar, an economic analyst for CNN, had conversations with executives who knew the choice was between being a bank or going back to innovation, "They decided to do the latter and they have moved away from finance. They have been selling off their financial assets and they are trying to now move into making things particularly geared for the emerging markets. A lot of people are really watching that company to see, hey, can a big American company that went this far into the process of financialization pull back and really move to a different paradigm? GE has since disassembled GE Capital, reinstating it to its former purpose. General Electric to slice up its empire The options are increasingly limited and investor confidence has been pummeled. Unless GE can convince another billionaire like Warren Buffett to bail them out again, many analysts are surmising the company will only survive if broken apart. One can interpret what Immelt said in his departure letter with new eyes, given the current state of affairs, "We were a classic conglomerate. Now people are calling us a year-old start-up.

Chapter 2 : Electrical engineering - Wikipedia

Unified Theory of Electrical Machines and A philosophical explanation to how a Universe can be created just from nothing Morgan A.T. General Theory of Electrical.

Signal processing Signal processing deals with the analysis and manipulation of signals. For analog signals, signal processing may involve the amplification and filtering of audio signals for audio equipment or the modulation and demodulation of signals for telecommunications. For digital signals, signal processing may involve the compression , error detection and error correction of digitally sampled signals. Analog signal processing is still important in the design of many control systems. DSP processor ICs are found in many types of modern electronic devices, such as digital television sets , [57] radios, Hi-Fi audio equipment, mobile phones, multimedia players , camcorders and digital cameras, automobile control systems, noise cancelling headphones, digital spectrum analyzers , missile guidance systems, radar systems, and telematics systems. In such products, DSP may be responsible for noise reduction , speech recognition or synthesis , encoding or decoding digital media, wirelessly transmitting or receiving data, triangulating position using GPS , and other kinds of image processing , video processing , audio processing , and speech processing. Telecommunications engineering Telecommunications engineering focuses on the transmission of information across a communication channel such as a coax cable , optical fiber or free space. Popular analog modulation techniques include amplitude modulation and frequency modulation. Once the transmission characteristics of a system are determined, telecommunication engineers design the transmitters and receivers needed for such systems. These two are sometimes combined to form a two-way communication device known as a transceiver. A key consideration in the design of transmitters is their power consumption as this is closely related to their signal strength. Satellite dishes are a crucial component in the analysis of satellite information. Instrumentation engineering Instrumentation engineering deals with the design of devices to measure physical quantities such as pressure , flow , and temperature. For example, flight instruments measure variables such as wind speed and altitude to enable pilots the control of aircraft analytically. Similarly, thermocouples use the Peltier-Seebeck effect to measure the temperature difference between two points. Flight instruments provide pilots with the tools to control aircraft analytically. Computer engineering Computer engineering deals with the design of computers and computer systems. This may involve the design of new hardware , the design of PDAs , tablets, and supercomputers , or the use of computers to control an industrial plant. However, the design of complex software systems is often the domain of software engineering , which is usually considered a separate discipline. Related disciplines[edit] The Bird VIP Infant ventilator Mechatronics is an engineering discipline which deals with the convergence of electrical and mechanical systems. Such combined systems are known as electromechanical systems and have widespread adoption. Examples include automated manufacturing systems , [68] heating, ventilation and air-conditioning systems , [69] and various subsystems of aircraft and automobiles. They design, develop, test, and supervise the deployment of electrical systems and electronic devices. For example, they may work on the design of telecommunication systems , the operation of electric power stations , the lighting and wiring of buildings , the design of household appliances , or the electrical control of industrial machinery. Fundamental to the discipline are the sciences of physics and mathematics as these help to obtain both a qualitative and quantitative description of how such systems will work. Today most engineering work involves the use of computers and it is commonplace to use computer-aided design programs when designing electrical systems. Nevertheless, the ability to sketch ideas is still invaluable for quickly communicating with others. The Shadow robot hand system Although most electrical engineers will understand basic circuit theory that is the interactions of elements such as resistors , capacitors , diodes , transistors , and inductors in a circuit , the theories employed by engineers generally depend upon the work they do. For example, quantum mechanics and solid state physics might be relevant to an engineer working on VLSI the design of integrated circuits , but are largely irrelevant to engineers working with macroscopic electrical systems. Even circuit theory may not be relevant to a person designing telecommunication systems that use off-the-shelf components. Perhaps the most important technical skills for electrical engineers are reflected in university programs, which emphasize strong numerical skills , computer literacy , and the ability to understand the technical language and concepts that relate to electrical engineering. A wide range of instrumentation is used by electrical engineers. For simple control circuits and alarms, a basic multimeter measuring voltage , current , and resistance may suffice. Where time-varying signals need to be studied, the oscilloscope is also an ubiquitous instrument. In RF engineering and high frequency telecommunications, spectrum analyzers and network analyzers are used. In some disciplines, safety can be a particular concern with instrumentation. For instance, medical electronics designers must take into account that much lower voltages than normal can be dangerous when electrodes are directly in contact with internal body fluids.

Chapter 3 : Master of Science

The program emphasizes the theory and application of advanced electrical engineering principles utilizing theoretical, computational and analytical methods and tools. The goal of the program is to produce forward-looking engineering professionals who are capable of making significant contributions to society.

His theory and many of his patents form the basis for the modern electric power system. Tesla is also noted for inventing the Tesla coil and a bladeless turbine which functions on the principles of fluid viscosity and the boundary layer effect. He occupied the 57th position, citing him as "[one of] the most farsighted inventors of the electrical age". They state his work on the rotating magnetic field and alternating currents helped electrify the world. The scientific compound derived SI unit measuring magnetic flux density or magnetic induction commonly known as the magnetic field B , the tesla, was named in his honor at the Conference general des poids et mesures, Paris, Biography Early years Tesla was born "at the stroke of midnight" with lightning striking during a summer storm. He was born in Croatia in the Austro-Hungarian Empire. His Serb father, Reverend Milutin Tesla, was a priest in the Orthodox Metropolitanate of Karlovci which gathered to Serbs of the "Greek-rite" as they were legally referred to in Austria-Hungary at the time. His mother, Djuka Mandic, from a prominent Serbia family of the Banija, made craft tools. He was one of five children, having one brother and three sisters. His godfather, Jovan Drenovac, was a Captain in the Krajina army. His family moved to Gospic in Tesla studied in Karlovac, present day Croatia, then studied electrical engineering at the Austria Politechnic in Graz, Austria While there, he studied the uses alternating current. He also developed a telephone repeater or amplifier. In he moved to Budapest to work for the telegraph company, American Telephone Company. For a while he stayed in Maribor, Slovenia. He was employed at his first job as an assistant engineer. Tesla suffered a nervous breakdown during this time. He worked designing improvements to electric equipment. In the same year, Tesla conceived of the induction motor and began developing various devices that use rotating magnetic fields for which he received patents in Tesla visualized the rotating fields and thereby designed the induction motor. He spent two to three weeks recuperating in Gospic and Tomingaj. All his life, Tesla kept a home-spun embroidered travel bag from his mother. He arrived in the US with 4 cents to his name, a book of poetry, and a letter of recommendation from Charles Batchelor, his manager in his previous job. Early employment Telsa worked for Thomas Edison for a time. Tesla worked nearly a year to redesign the inferior construction. The initial financial investors disagreed with Tesla on his plan for an alternating current motor and eventually relieved Tesla of his duties at the company. Tesla was unemployed for a time. Tesla worked on a New York street gang, as a laborer, from to to raise capital to eat and for his next project. In , he constructed the initial brushless alternate-current induction motor. He demonstrated the brushless two-phase one-fifth horsepower induction motor to the American Institute of Electrical Engineers in Also in , he developed the principles of his Tesla coil. These systems would allow alternating current [AC] electricity to be transmitted over large distances. X-rays and friendships In April , Tesla began investigating what would later be called X-rays using his own devices as well as Crookes tubes. He did this by experimenting with high voltages and vacuum tubes. His technical publications indicate that he invented and developed a special single-electrode X-ray tube. The modern term for this is the bremsstrahlung process, in which a high-energy secondary X-ray emission is produced when charged particles such as electrons pass through matter. Around , Tesla became a USA citizen. When he was 36 years old, the first patents concerning the polyphase power system were granted. He continued researching rotating magnetic field principles and polyphase power distribution. He lit vacuum tubes wirelessly in the lab, providing evidence for the potential of wireless power transmission. Around this time, Tesla developed a close and lasting friendship with author and humorist Mark Twain. He performed several experiments including taking photographs of the bones of his hand. Tesla did not make his findings widely known. Much of his research was lost in the Houston Street lab fire. His later X-ray experimentation by vacuum high field emissions led him to alert the scientific community first to the biological hazards associated with X-ray exposure. From to , Tesla investigated high frequency alternating currents. He generated one million volts of alternating currents using a conical Tesla Coil. He developed the skin effect in circuitry, designed tuned circuits, invented a machine for inducing sleep, cordless gas discharge lamps, and transmitted electromagnetic energy without wires, effectively building the first radio transmitter. Louis, Missouri, Tesla made the first public demonstration of radio communication in Addressing the Franklin Institute in Philadelphia, Pennsylvania and the National Electric Light Association, he described and demonstrated in detail the principles of radio communication. The apparatus he used contained all the elements that were incorporated into radio systems before the development of the vacuum tube. The public at large observed firsthand the qualities and abilities of AC power. All the exhibits were from commercial enterprises. Edison, Brush, Western Electric, and Westinghouse all had exhibits. General Electric Company backed by Edison and J. Morgan proposed to power the electric fair with direct current at the cost of one million dollars. A two-phase induction motor was driven by current from the main generators to power the system. Westinghouse displayed several polyphase systems. The exhibits included a switchboard, polyphase generators, step-up and step-down transformers, transmission line, commercial size induction motors, commercial size synchronous motors, and rotary direct current converters one of which was operating a railway motor. The working-scale system allowed the public a view of a system of polyphase power which could transmit long distances. Meters and other auxiliary devices were also present. Tesla displayed the first neon light tubes at the exposition, demonstrating his phosphorescent lighting powered without wires by high-frequency fields. Tesla displayed the first practical phosphorescent lamps a precursor to fluorescent lamps. His innovations in this type of light emission were not regularly patented. This device explains the principles of the rotating magnetic field and his induction motor. The Egg consisted of a polyphase field coil underneath a plate with a copper egg positioned over the top. When the sequence of the coils were energized, the magnetic field arrangement inductively created a rotation on the egg and made it stand up on end appearing to resist gravity. On August 25, Elisha Gray introduced Tesla for the delivery of a lecture on mechanical and electrical oscillators. Tesla explained his work for efficiently increasing the work at high frequency of reciprocation. As Electrical Congress members listened, Tesla delineated mechanisms which could produce oscillations of constant periods irrespective of the pressure applied and irrespective of frictional losses and loads. He explained the working means of producing constant period electric currents not resorting to spark gaps or breaks and how to produce these with reliable mechanisms. War of currents During this time, direct current was the standard, and Edison was not disposed to lose all his patent royalties to a former employee. In his work with the rotary magnetic fields, Tesla devised the system for transmission of power over long distances. He partnered with George Westinghouse to commercialize this system. Experts announced proposals to harness the Niagara Falls for generating electricity. The commission was lead by Lord Kelvin and backed by entrepreneurs such as J. Some doubted that the system would generate enough electricity to power industry in Buffalo. Tesla was sure it would work, saying that Niagara Falls had the ability to power the entire eastern U. On November 16, , the first transmission of electrical power between two cities was sent from Niagara Falls to industries in Buffalo from the first commercial two-phase power plants known as hydroelectric generators at the Edward Dean Adams Station. He also set the 60 hertz standard for North America. It took five years to complete the whole facility. Designs and Colorado When Tesla was 41 years old, he filed the first basic radio patent No. A year later, he demonstrated a remote controlled boat to the US military. Tesla believed that the military would want things such as radio-guided torpedoes. These devices had an innovative coherer and a series of logic gates. Mark Twain wrote Tesla over the demonstrations, though the military took little interest. Radio remote control remained a novelty until the Space Age. At the age of 42, Tesla devised an electric igniter for gasoline engines. His designs are nearly identical to ideas which deal with the same process which modern internal combustion engines use. Around , Tesla began conducting research in Colorado Springs. He experimented with high-voltage electricity and the possibility of transmitting and distributing large amounts of electrical energy over long distances without using wires. He also conceived the science of telegeodynamics, now known as seismology, and explained that a long sequence of small explosions could be used to find ore underground and could create earthquakes large enough to destroy the Earth. He did not experiment with this as he felt there would not be "a desirable outcome". Colorado Springs In , Tesla decided to move his research to Colorado , where he could have room for his high-voltage high-frequency experiments. After searching the country for a new location, Tesla chose Colorado Springs for his next series of experiments, primarily because of the frequent electrical storms and the thinness of the air reducing its dielectric level , making it more conductive. Also, the property was free and electric power was available from the El Paso Power Company. Today electromagnetic intensity charts from the geological survey also show that the ground around his lab possesses a denser field than most of the surrounding area.

Chapter 4 : ICEE'99, Czech Republic, Paper No.

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Basic Theory and Applications of Electron Tubes , Departments of the Army and Air Force, , pages This is an excellent, relatively modern text on vacuum tubes. Very practical, not too much math, and it has some very nice illustrations. Pullen, , pages This book presents a method to design tube amplifier stages using curves of constant grid-to-plate transconductance and plate conductance. Equations and step-by-step instructions are provided to select the correct tube, calculate gain and distortion, and other relevant parameters. Full sets of curves are provided for 35 different tube types. Many thanks to Robb Legg, who did all the digitization work, including OCR and reproducing the graphs - a tremendous amount of work! Covers tube theory, tuned and un-tuned amplifiers, oscillators, and power supplies. I think this book has nearly everything you need to know to design and build tubes. Beware, the PDF file is over megabytes! A collection of technical papers from RCA, covering the period from through Nearly pages of technical papers, covering such topics as "Thin-film emission" and the famous O. Shade "Beam Power Tubes". Seachable DJVU file 7. A continuation of above, a collection of technical papers from RCA, covering the period from through Guntherschulze, , pages - Courtesy of an anonymous donor A translation of an older German text on rectifier tubes. McArthur, , pages - Courtesy of anonymous donor A fairly early, concise treatment of the theory of vacuum tubes. Not a lot of math, basic info on circuits. Discusses tube life, tube ratings, protection, and other similar topics. Getting the Most Out of Vacuum Tubes , Robert Tomer, , pages - Courtesy of John Atwood This book addresses the "Types and causes of failures, what to expect from tubes, testing methods, and all about tube maintenance programs". Describes graphical design methods for tube circuits as opposed to equation-based design. Sections on reactive loads and balanced amplifiers that discuss topics not seen in many other texts. I wish I could read Dutch. This book by Philips appears to be a nice thorough treatment of how vacuum tubes work, how they are built, and how they are applied in radio circuits. Some very nice photos of tubes in various states of disassembly. A detailed technical discussion on the materials used to make vacuum tubes, including glass, metals, and ceramics, as well as the interfaces between them.. Nice photos of "Appealing Substation Buildings". Wagener, - Thanks to anonymous donor This 2-volume set is a very comprehensive treatment of the theory and manufacture of oxide-coated cathodes for tubes. Strangely enough, volume I covers more practical aspects, and volume II is mostly physics Seachable DJVU file 2. Seachable DJVU file 3. Bruining, , pages - Thanks to Justin Carmichael A very detailed look at secondary electron emission in vacuum tubes One of the best books I know of to learn enough about how tubes really work to be able to design with them. Covers tube testers in some detail, as well as early television circuits. Langford Smith, , pages The quintessential vacuum tube design handbook,. This is the older, and smaller, third edition Covers all the essential of tube electronics design, including the basics, tube theory, load lines, amplifier design, etc. Langford Smith, , 1, pages! The later and much more comprehensive version of the RDH3 above, this is probably the best book out there for the casual vacuum tube circuit designer. Coveted by the audio guys, it also has plenty of info on the design of radio receivers. There are PDF versions already floating around the web This book will explain how they work, as well as other charge-controlled storage tubes used as cameras and computing elements. Detailed, complete with plenty of math and drawings. An early tube text, discusses triodes and their application as amplifiers, particularly in radios. Another fantastic vacuum tube text, with lots of detail and math to go with it. Mostly about triodes, pentodes were just starting to be used when this was written. Covers how tubes work in considerable detail, and discusses low-power amplifiers and detector circuits. A quite early book on the theory behind vacuum tubes. Discusses the theory behind how tubes work, and also shows common applications of the time amplifiers, oscillators, modulators, and detectors. An outstanding college textbook on the design of vacuum tubes. Very comprehensive theoretical treatment. Edson, , pages - Courtesy of an anonymous donor pages of design details about tube oscillators, including crystal-controlled, variable, relaxation, and other types. Nice modern text about vacuum tube rectifiers and their application. Includes single and multiphase circuits, filter designs, and rectifier tube characteristics. Short and to the point, a good reference!

Chapter 5 : Boolean Algebra Theorems and Laws of Boolean Algebra

A.T. Morgan is the author of Yazoo (avg rating, 0 ratings, 0 reviews, published), Morgan General Theory Of Electrical Machines (avg rating.

History[edit] The erosive effect of electrical discharges was first noted in by English physicist Joseph Priestley. Lazarenko, were tasked in to investigate ways of preventing the erosion of tungsten electrical contacts due to sparking. They failed in this task but found that the erosion was more precisely controlled if the electrodes were immersed in a dielectric fluid. This led them to invent an EDM machine used for working difficult-to-machine materials such as tungsten. Initially constructing their machines from feeble electric-etching tools, they were not very successful. But more powerful sparking units, combined with automatic spark repetition and fluid replacement with an electromagnetic interrupter arrangement produced practical machines. Later machines based on their design used vacuum tube circuits that were able to produce thousands of sparks per second, significantly increasing the speed of cutting. The tool electrode in wire EDM is simply a wire. To avoid the erosion of material from the wire causing it to break, the wire is wound between two spools so that the active part of the wire is constantly changing. The earliest numerical controlled NC machines were conversions of punched-tape vertical milling machines. Machines that could optically follow lines on a master drawing were developed by David H. Master drawings were later produced by computer numerical controlled CNC plotters for greater accuracy. Electrical discharge machining is a machining method primarily used for hard metals or those that would be very difficult to machine with traditional techniques. EDM typically works with materials that are electrically conductive, although methods have also been proposed for using EDM to machine insulating ceramics [8] [9]. EDM can cut intricate contours or cavities in pre-hardened steel without the need for heat treatment to soften and re-harden them. This method can be used with any other metal or metal alloy such as titanium , hastelloy , kovar , and inconel. Also, applications of this process to shape polycrystalline diamond tools have been reported. However, caution should be exerted in considering such a statement because it is an idealized model of the process, introduced to describe the fundamental ideas underlying the process. Yet, any practical application involves many aspects that may also need to be considered. For instance, the removal of the debris from the inter-electrode volume is likely to be always partial. Thus the electrical properties of the dielectric in the inter-electrodes volume can be different from their nominal values and can even vary with time. The inter-electrode distance, often also referred to as spark-gap, is the end result of the control algorithms of the specific machine used. The control of such a distance appears logically to be central to this process. Also, not all of the current between the dielectric is of the ideal type described above: The control system of the electrode may fail to react quickly enough to prevent the two electrodes tool and workpiece from coming into contact, with a consequent short circuit. This is unwanted because a short circuit contributes to material removal differently from the ideal case. The flushing action can be inadequate to restore the insulating properties of the dielectric so that the current always happens in the point of the inter-electrode volume this is referred to as arcing , with a consequent unwanted change of shape damage of the tool-electrode and workpiece. Ultimately, a description of this process in a suitable way for the specific purpose at hand is what makes the EDM area such a rich field for further investigation and research. In this way, a large number of current discharges colloquially also called sparks happen, each contributing to the removal of material from both tool and workpiece, where small craters are formed. The size of the craters is a function of the technological parameters set for the specific job at hand. They can be with typical dimensions ranging from the nanoscale in micro-EDM operations to some hundreds of micrometers in roughing conditions. The presence of these small craters on the tool results in the gradual erosion of the electrode. This erosion of the tool-electrode is also referred to as wear. Strategies are needed to counteract the detrimental effect of the wear on the geometry of the workpiece. One possibility is that of continuously replacing the tool-electrode during a machining operation. This is what happens if a continuously replaced wire is used as electrode. The tool-electrode can also be used in such a way that only a small portion of it is actually engaged in the machining process and this portion is changed on a regular basis. This is, for instance, the case when using a rotating disk as a tool-electrode. The corresponding process is often also referred to as EDM grinding. This is often referred to as multiple electrode strategy, and is most common when the tool electrode replicates in negative the wanted shape and is advanced towards the blank along a single direction, usually the vertical direction i. This resembles the sink of the tool into the dielectric liquid in which the workpiece is immersed, so, not surprisingly, it is often referred to as die-sinking EDM also called conventional EDM and ram EDM. The corresponding machines are often called sinker EDM. Usually, the electrodes of this type have quite complex forms. If the final geometry is obtained using a usually simple-shaped electrode which is moved along several directions and is possibly also subject to rotations, often the term EDM milling is used. Therefore, wear is a major problem in that area. The problem of wear to graphite electrodes is being addressed. In one approach, a digital generator, controllable within milliseconds, reverses polarity as electro-erosion takes place. That produces an effect similar to electroplating that continuously deposits the eroded graphite back on the electrode. In another method, a so-called "Zero Wear" circuit reduces how often the discharge starts and stops, keeping it on for as long a time as possible. Two broad categories of generators, also known as power supplies, are in use on EDM machines commercially available: In the first category, the main parameters to choose from at setup time are the resistance s of the resistor s and the capacitance s of the capacitor s. In an ideal condition these quantities would affect the maximum current delivered in a discharge which is expected to be associated with the charge accumulated on the capacitors at a certain moment in time. Little control, however, is expected over the time duration of the discharge, which is likely to depend on the actual spark-gap conditions size and pollution at the moment of the discharge. The RC circuit generator can allow the user to obtain short time durations of the discharges more easily than the pulse-controlled generator, although this advantage is diminishing with the development of new electronic components. In generators based on transistor control, the user is usually able to deliver a train of pulses of voltage to the electrodes. Each pulse can be controlled in shape, for instance, quasi-rectangular. In particular, the time between two consecutive pulses and the duration of each pulse can be set. The amplitude of each pulse constitutes the open circuit voltage. Thus, the maximum duration of discharge is equal to the duration of a pulse of voltage in the train. Two pulses of current are then expected not to occur for a duration equal or larger than the time interval between two consecutive pulses of voltage. The maximum current during a discharge that the generator delivers can also be controlled. Because other sorts of generators may also be used by different machine builders, the parameters that may actually be set on a particular machine will depend on the generator manufacturer. The details of the generators and control systems on their machines are not always easily available to their user. This is a barrier to describing unequivocally the technological parameters of the EDM process. Moreover, the parameters affecting the phenomena occurring between tool and electrode are also related to the controller of the motion of the electrodes. A framework to define and measure the electrical parameters during an EDM operation directly on inter-electrode volume with an oscilloscope external to the machine has been recently proposed by Ferri et al. When machining different materials in the same setup conditions, the actual electrical parameters of the process are significantly different. However, as Van Dijck himself admitted in his study, the number of assumptions made to overcome the lack of experimental data at that time was quite significant. It resulted in three scholarly papers: These models give the most authoritative support for the claim that EDM is a thermal process, removing material from the two electrodes because of melting or vaporization, along with pressure dynamics established in the spark-gap by the collapsing of the plasma channel. However, for small discharge energies the models are inadequate to explain the experimental data. All these models hinge on a number of assumptions from such disparate research areas as submarine explosions, discharges in gases, and failure of transformers, so it is not surprising that alternative models have been proposed more recently in the literature trying to explain the EDM process. Among these, the model from Singh and Ghosh [22] reconnects the removal of material from the electrode to the presence of an electrical force on the surface of the electrode that could mechanically remove material and create the craters. This would be possible because the material on the surface has altered mechanical properties due to an increased temperature caused by the passage of electric current. Given the many available models, it appears that the material removal mechanism in EDM is not yet well understood and that further investigation is necessary to clarify it, [17] especially considering the lack of experimental scientific evidence to build and validate the current EDM models. In Material removal rate MRR from all selected parameters, spark current I is the most significant input factor affecting the machining of workpiece. The performance is affected by discharge current, pulse on time, pulse off time, duty cycle, voltage for EDM. For tool wear rate TWR from the all selected parameters, spark current I is the most significant input factor affecting the machining of workpiece followed by spark time and voltage. Innovative technology in the EDM is unceasingly progressing to make this procedure further appropriate for the Machining. In the field of manufacturing additional attention is on the optimization of the method by dropping the number of Electrode [23].

Chapter 6 : Electrical discharge machining - Wikipedia

General Requirements All students who seek candidacy into the B.S./M.S. program will be required to complete the B.S. degree requirements and the M.S. degree requirements for electrical engineering. Up to six credits of graduate coursework may count towards the undergraduate degree.

Garrett, at the early age of 14 decided that he should travel north to Ohio in order to receive a better education. He moved to Cincinnati and then to Cleveland, working as a handyman in order to make ends meet. In Cleveland, he learned the inner workings of the sewing machine and in opened his own sewing machine store, selling new machines and repairing old ones. In Morgan married Mary Anne Hassek with whom he would have three sons. In , Morgan opened a tailoring shop, selling coats, suits and dresses. While working in this shop he came upon a discover which brought about his first invention. He noticed that the needle of a sewing machine moved so fast that its friction often scorched the thread of the woolen materials. He thus set out to develop a liquid that would provide a useful polish to the needle, reducing friction. When his wife called him to dinner, he wiped the liquid from his hands onto a a piece of pony-fur cloth. When he returned to his workshop, he saw that the fibers on the cloth were now standing straight up. He theorized that the fluid had actually straightened the fibers. Morgan then decided try the fluid on himself, to small portions of his hair at first, and then to his entire head. He was successful and had invented the first human-hair straightener. He marketed the product under the name the G. Morgan Hair Refining Cream and sold by his G. Morgan Refining Company, which became a very successful business. In , Morgan developed another invention, much different from his hair straightener. The Safety Hood consisted of a hood worn over the head of a person from which emanated a tube which reached near the ground and allowed in clean air. The bottom of the tube was lined with a sponge type material that would help to filter the incoming air. Another tube existed which allowed the user to exhale air out of the device. The device is also efficient and useful for protection to engineers, chemists and working men who are obliged to breathe noxious fumes or dust derived from the materials in which they are obliged to work. At the Second International Exposition of Safety and Sanitation, the device won first prize and Morgan was award a gold medal. While demonstrations were good for sales, the true test of the product would come only under real life circumstances. That opportunity arose on July 24, when an explosion occurred in a tunnel being dug under Lake Erie by the Cleveland Water Works. The tunnel quickly filled with smoke, dust and poisonous gases and trapped 32 workers underground. They were feared lost because no means of safely entering and rescuing them was known. Garrett and his brother Frank quickly arrived at the scene, donned the Safety Hood and entered the tunnel. After a heart wrenching delay, Garrett appeared from the tunnel carrying a survivor on his back as did his brother seconds later. The crowd erupted in a staggering applause and Garrett and Frank reentered the tunnel, this time joined by two other men. While they were unable to save all of the workers, the were able to rescue many who would otherwise have certainly died. Morgan received a gold medal from a Cleveland citizens group as well as a medal from the International Association of Fire Engineers, which also made him an honorary member. Soon, orders came in from fire and police departments across the country. Unfortunately, many of these orders were canceled when it was discovered that Morgan was Black. Apparently, many people would rather face danger and possibly death than rely on a lifesaving device created by a Black man. Although he could have relied on the income his Gas Masks generated, Morgan felt compelled to try to solve safety problems of the day. One day he witnessed a traffic accident when an automobile collided with a horse and carriage. The driver of the automobile was knocked unconscious and the horse had to be destroyed. He set out to develop a means of automatically directing traffic without the need of a policeman or worker present. At that point, Morgan was honored by many influential people around him, including such tycoons as John D. Morgan after whom he named one of his sons. Although his successes had brought him status and acclaim, Morgan never forgot that his fellow Blacks still suffered injustices and difficulties. He died on July 27, and because of his contribution, the world is certainly a much safer place.

Chapter 7 : News & Research

Abstract. Of a variety of methods used for the analysis of electrical machines and drives, the generalized machine theory is probably the most versatile one, making possible both the transient and steady-state analysis of many types of electrical machines including the drive systems.

You will get both online classroom instruction and hands-on lab experience to help prepare you to excel as an electrical engineer. Because this program fills a market-driven educational need, earning your BSEE could give you a step up in starting a career in aerospace, telecommunications, defense, automotive, medical, construction, chemical, and more. Program Educational Objectives Within a few years after graduation, you should be able to use your skills and knowledge in electrical engineering to: Become a valuable contributor in the engineering field. Continue life-long learning through advanced degrees, training, and professional development. Advance in electrical engineering or related field to a position of increased technical, supervisory, or management responsibilities. Develop an appreciation of the importance of ethical practices and the ethical responsibility to the public. Courses in the BSEE include foundations in math, computer science, and physical sciences. International System of Units Digital and logic circuit analysis and design in 6 main parts Energy conversion and transport Passive microwave circuit analysis and design Radar and RF signal propagation, transmission, and reception Note: These materials are not covered by the university undergraduate book grant. Program Objectives In addition to the institutional and degree level learning objectives, graduates of this program are expected to achieve the following: Student Outcomes Apply knowledge of mathematics, science, and engineering. Design and conduct experiments, as well as analyze and interpret data. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. Function on multidisciplinary teams. Identify, formulate, and solve engineering problems. Understand professional and ethical responsibility. Engage in the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context. Recognize the need for, and ability to engage in life-long learning. Develop knowledge of contemporary issues. Use the techniques, skills, and modern engineering tools necessary for engineering practice. Degree at a Glance.

Chapter 8 : All About Circuits - Electrical Engineering & Electronics Community

Electronic & Electrical Unified Theory of Electrical Machines. Butterworth Morgan A.T. General Theory of Electrical Machines. Heydon Say M.G.

In general, they are harder to design and harder to understand than single-processor sequential algorithms. Distributed algorithms are used in many practical systems, ranging from large computer networks to multiprocessor shared-memory systems. They also have a rich theory, which forms the subject matter for this course. What do distributed algorithms researchers do? They we define various kinds of distributed computing environments, including shared-memory and network-based environments, and identify problems to be solved in those environments. They design new algorithms for these problems, and analyze the correctness, performance, and fault-tolerance of their algorithms. They also prove lower bounds and other impossibility results, which explain why certain tasks cannot be carried out in certain kinds of distributed settings, or cannot be carried out within certain cost constraints. Researchers typically study problems that arise in practical distributed systems, including problems of communication, data management, resource management, synchronization, and distributed agreement. Sometimes, the results have impact on practical distributed system design. This year, the course will be taught by Prof. Nancy Lynch, with some help from Dr. The core of the material will consist of basic distributed algorithms and impossibility results, as covered in Prof. This will be supplemented by some updated material on topics such as self-stabilization, wait-free computability, and failure detectors, and some new material on scalable shared-memory concurrent programming. Usually, the students who take the course are a mixture of PhD students and MEng students. Since the course is run at a PhD level, most MEng students should find it challenging. Prerequisites To take 6. General knowledge about some distributed systems. Experience with sequential algorithms and their analysis. Experience with formal models of computation desirable, but not essential. Texts The primary source will be the book Distributed Algorithms by Prof. Errata PDF This book has gone through many printings, but we have made no changes since the fourth printing, so fourth printings or later are just fine. Known errata for early printings are collected in errata lists. The book refers to many papers from the research literature on distributed algorithms; you might want to track down and read some of these. Recommended Other books that you will find useful are: Attiya, Hagit, and Jennifer Welch. Fundamentals, Simulations, and Advanced Topics. This is another textbook on distributed algorithms, initially published a little after the Lynch book. It now has a second edition. The material covered overlaps quite a lot with the Lynch book, though Attiya and Welch do cover some topics, like clock synchronization, that Lynch does not cover. The style is a little less formal. Herlihy, Maurice, and Nir Shavit. The Art of Multiprocessor Programming. This undergraduate textbook covers basic algorithms and techniques for multiprocessor programming. Guerraoui, Rachid, and Michal Kapalka. Morgan and Claypool, This monograph presents basic theoretical results about the possibility and costs of implementing transactional memory for shared-memory multiprocessors. This book gives a good description of self-stabilizing distributed algorithms. Self-stabilization is a strong kind of fault-tolerance, which we will study near the end of the course. In addition, some research papers that are not covered in the textbook will be covered in class and on problem sets. These papers are listed in the Readings as supplementary readings. Course Requirements Readings Readings that cover the material for each class will be announced ahead of time. For most classes, these will be sections from the textbook. For some classes, they will be research papers from the supplementary reading list. Reading a research paper will generally take more time than reading sections from the textbook, so be prepared to put in the extra time. We expect students to read the assigned material ahead of time and to come to class prepared to discuss it. Problem Sets These are intended to help you to understand the material covered in class. Most problems involve algorithms and problems already covered; some will be designed to get you started thinking about ideas to be discussed in later classes. Specifically, approximately five problems will be given out every Thursday. The problems will be batched and due every two weeks, at the beginning of class on alternate Thursdays. There will be a total of seven problem set due dates. No late homework assignments will be accepted. However, in the case of a serious emergency, please talk to the course instructors or the teaching assistant. Homework is an important part of your grade. When grading homework problems, we will try to give full credit to solutions that include all the important logical steps and ideas. We consider it a minus for a write-up to be lengthy and overly detailed. An exception is when we specifically ask for details, for instance, in formal proofs of correctness of algorithms. We have software available to assist you in writing syntactically-correct distributed algorithms; we are requiring that you use it for your homework assignments. This software consists mainly of the Tempo language processor, which allows specification of algorithms as interacting state machines. Information about how to download the software and how to get started using it appears at VeroModo. We are not requiring you to use any of these tools, but of course, you are welcome to try them. You will probably find the Tempo User Guide and test examples useful. This is part of the Synthesis series of computer science monographs, published by Morgan and Claypool. Policy on Homework Collaboration You are strongly encouraged to discuss possible solutions with other class members. Many students in past incarnations of this course have formed homework discussion groups. However, you must always write up the solutions entirely on your own. Problem Set Grading For each problem set, a group of students will be responsible for working with the course staff to grade the solutions. If possible, we would like the grading to be completed by the Monday afternoon after the homework assignments are handed in, so that we can record the grades and hand them back on Tuesday. The number of times you have to grade over the course of the semester will depend on the size of the class. Part of your grade will depend on the quality and promptness of your work on problem set grading. Exams There will be no exams. No midterm, no final. You can go home after the last class. Grading Your course grade will be based on problem set grades, problem set grading, and class participation. Problem sets will be graded on inclusion of the important logical steps and ideas. Class participation will be evaluated based on attendance and quality and quantity of participation. Problem set grading will be judged by quality and promptness.

Chapter 9 : Radionics - Wikipedia

Electrical engineering is a professional engineering discipline that generally deals with the study and application of electricity, electronics, and theinnatdunvilla.com field first became an identifiable occupation in the later half of the 19th century after commercialization of the electric telegraph, the telephone, and electric power distribution and use.

This paper describes in a very short way the latest versions 2. In the following, except some short theoretical background on the models used, and some data on the Neapolis project, are included the main features, the simulated systems, the program structure, some indicative results, and some developments from future versions. Computer assisted learning, Electrical Motors, Power Electronics, Motor Drives, Interactive Simulation 1 Introduction Simulation is a well known process which is used in a lot of different cases in every area of Engineering. The performance of the real system is described through a set of mathematical equations. Their solution, in the most of the cases through a computer program, shows the performance of the simulated system on the computer screen, in the most of the cases through curves. The results are very useful in the case of systems or devices which have not yet been developed design case or they are not available and must be used in the near future training case. Various types of simulation are available depending of the mathematical model used Steady state or transient state models each one with various and different features. Its ready to use structure can help the students to understand the topics covered in the theory and the laboratory because it can show them immediately the results of system performance in various cases very simply on the screen of their home or university computer. Neapolis can be used also before teaching or experimenting in the laboratory because of its interactive nature and can help the student to understand how the real system works and what kind of results can be expected at the laboratory. Finally the student using the program can have a good idea on the performance of not available systems. The initial model of each kind of electrical motor is that which is known from general theory of electrical machines. The differential equations of the resulting system are converted to algebraic equivalent equations using the method of equivalent models for non-resistive passive elements. The results are plotted on the computer screen as curves of the system variables versus time. The motor has a stationary part stator and a rotating part rotor. Both members have windings, which carry electrical currents and the rotor motion is created from the interaction between stator and rotor electromagnetic fields, which come from the current conduction of the windings conductors. The operation of such an electrical motor in the dynamic state versus time is described using differential equations a for the interrelation of currents, voltages and fluxes of the motor windings which include terms depending upon the time and the relative position of the windings and b for the balance between motor developed electromagnetic torque, load torque and change of motor speed. The problems that must be solved during the development of the final models for the simulation of an electrical motor are: The system of electrical differential equations of alternating current motor is transformed from the real three phase system to equivalent two phase d-q system using the well known transformation of general machine theory [1, 4]. Thus the system of resulting differential equations has fewer equations 4 or 5 instead 6 or 7 and coefficients independent from time and rotor position. The system of transformed electrical differential equations for the direct current motor is very simpler with fewer equations 1 or 2 the number of which depends on the motor field kind [2]. The system of transformed differential equations is completed with the differential equations of rotor motion 1 or 2. For the system solution it is usually used a slow but exact method of integration Runge-Kutta. To reduce the time of computer solution of differential equations, these equations are transformed to equivalent algebraic using a known method [3] the main idea of which is to replace each inductive or capacitive element with an equivalent circuit consisting from a resistance in series with a voltage source the values of which depend from the value of the element inductance or capacitance , the value of time step and the voltage source history. The rotor motion differential equations are solved easily using the known method of Simpson rule of integration. Thus there are many different kinds of converters from the most simple a diode to the most complicated a multiphase cycloconverter. The converter is composed mainly from valves, it is supplied from a voltage or current source and supplies a passive load or an electrical motor. Each converter valve is considered as a switch, which can be open or closed. The state of each switch is characterised with a state variable, the value of which can be one switch closed or zero switch open. Each valve opens when its current becomes zero and closes when its anode to cathode voltage becomes positive diode and its gate gets a firing pulse thyristor. The converter output voltage is calculated from the input voltage, the state variables of the converter valves and the converter topology. The output current is calculated from the differential equations of the output load which, using the method of equivalent elements, are transformed to algebraic. The valve currents are calculated from the output current and the converter topology. The valve voltages are calculated from the input and output voltages and the converter topology. The above method [5, 6] of dynamic equivalents is applied to line commutated converters and to forced commutated converters ignoring the very fast commutation circuits. Thus the system model is composed from the models of the individual components which have been developed in the above sections. It has started late with some simple simulations using a very simple language at that time Microsoft Quick Basic 4. The first draft version of the package came in September and from that time every year there is a new version which is the result of the work of the students in Final Projects and Practical Semesters and the final correction and integration which is done by the author during summer. The latest full existing version 2. Some results of the program have been presented in various Conferences [7, 8, 9, 10, 11] as papers but the program as an integrated educational tool has been presented to its physical users students and Professors many times during the last years in various Institutions located in different countries Spain, The Netherlands, Germany, Belgium, Greece, UK, Portugal, Slovak Republic. The following Institutions have worked under various forms in the project: Every program can also simulate different kinds of the same system and the result is that the package can show the performance of several hundreds of different systems. The simulation method used is the same and also the same solution method is used to provide faster solution. The models used are detailed for Motors and Motor Drives General Theory of Electrical Machines but the Converter Valve is a simple switch even if the Converter is considered to be a set of switches which produce various groups of equations depending of the specific switching group conduction state. There is a general Shell which is used to select the Program which will be used one from 26 and later there is a fixed structure for each program Definition, Simulation, Results Processing. The main features of the program are: Figure 1 Multi-period Simulation Screen Figure 2. This version named 4. In the next figures 7,9 are shown two new features which were not included in DOS version: In the paper are presented indicative results from some of the developed programs. Digital Simulation of Symmetrical Induction Machinery. General Theory of Electrical Machines. Power Electronics and AC Drives. Dynamic Simulation of a Cycloconverter driven squirell cage induction motor. A three phase dynamic model for the assessment of the transient behaviour of ac-dc systems. Conference on Thyristor and Variable Static Equipment for ac and dc transmission. In Informatics in the 90ties decade. A Greek product for the European market. In Technology and Automatisation.