DOWNLOAD PDF BEGINNERS GUIDE TO ELECTRICAL ENGINEERING

Chapter 1 : The Simple Guide To Learning Electronics For Beginners

Electrical Engineering Tour â€" This website is a complete package of electrical engineering tours, wherein you will find tutorials and everything you want to know about the branch.

Start Building Circuits If you would like to learn public speaking â€" what do you think is the best way to do it? Study it or actually do it? So as soon as possible, start building circuits. This is the number one thing to do if you want to learn electronics. The easiest way to start is by building kits. All you need to do is follow the instructions. But, eventually you should free yourself from these instructions and start building circuits on your own. Start by building some circuits using breadboards and stripboards. I have written a super practical eBook you might find helpful: Getting Started With Electronics. The book gives you step-by-step instructions on building your first circuits â€" from a blinking light to a music-playing gadget. It also covers the basics of electronics: I recommend you to read it and do the steps to get comfortable with building circuits. It also comes with a kit: They are one of the most useful tools in electronics. You can choose how deep you want to go at this step. Maybe you just want to read about the basics of microcontrollers , or maybe you want to go deeper play around with some more advanced microcontroller topics for a while. One of the simplest ways to get started with microcontrollers is with Arduino. Take on a project that you feel inspired by. Something you think would be really cool to make. By doing this, you will meet many challenges. And these challenges are good, because they will show you what you need to learn. And some useful circuit concepts, like the current limiting resistor. A good resource for you, when starting your own project, is how to design your own schematics from scratch. Are you a beginner and want to learn electronics? Let me know what you are struggling with by leaving a comment below. And if you like it â€" please share it.

Chapter 2 : NEW The Beginner's Guide to Engineering: Chemical Engineering by John T. Stimus | eBay

The Beginner's Guide to Engineering series is designed to provide a very simple, non-technical introduction to the fields of engineering for people with no experience in the fields.

A Useful Introduction to Electric Motors A Useful Introduction to Electric Motors December 17, by Author One of the fundamental elements of an electrical engineer is knowing about the different types of electric motors. Without electric motors, we would not have power tools, household appliances, or even cars. Those who are looking to enter an online or traditional electrical engineering program, or currently enrolled students, can use this post as a handy reference guide for studying the basics of DC and AC electric motors. The speed in a DC motor can be adjusted through the intensity of its current. The current is carried through an armature or stator. There are a few different types of DC motors that are briefly discussed in the following list: Brushed BDC Motors pictured to the right have a brush on the inside that alternates the electrical current commutates through the armature at the same speed as the rotation of the motor. Instead, the current in the motor is commutated electronically through the stator and the magnetic field. AC Motors A motor that reverses the direction of an electrical current at regular times is called an alternating current motor, or more commonly known as an AC motor. This type of motor uses opposing and attracting magnetic forces to propel the AC through the motor. There are magnets attached to both an external stationary stator, and an internal rotor. The rotor is able to move because the current is reacting to the magnetic poles, creating a rotating magnetic field. There are many different types of AC motors, and the most common ones are mentioned below: Induction Motors, also known as asynchronous motors, rely solely on AC as a power source. An induced current occurs in the rotor conductors and is caused by the interaction between the rotor and the magnetic field rotating around the stator. This interaction creates a relative speed which is less than a synchronous speed defined below. There are two primary types of rotors used in induction motors that are listed below: This type of rotor got its name based on its appearance. Wound Rotor â€” The windings are attached to external resistances through several slip rings. These motors require an additional starting mechanism that allows for the poles attached to the rotor to begin moving almost as fast as what is needed, the synchronous speed. The synchronous speed is when the rotor is moving at the same speed as the currents that are being supplied to the motor. The magnetic field will then affect both the rotor poles and the rotating poles attached to the stator, allowing them to reach the synchronous speed. There are many more exciting facets to motors, with this list as just the beginning. In an electrical engineering program, you will have the opportunity to expand your knowledge about the inner workings of electric motors and so much more!

Chapter 3 : A Useful Introduction to Electric Motors Â» Electrical â€‹Engineering â€‹Schools

This guide will show you a few of the common symbols that you are sure to see in your future electrical engineering career. The Language of Circuitry First, let's look at some of terms that you will need to know.

These are easily recognised, and should cause no fear or panic. Some years ago, various European makers used colour codes, but these have gone by the wayside for nearly all components available today. The type of marking depends on the type of capacitor in some cases, and there are several different standards in common use. Because of this, each type shall be covered separately. These caps are usually used when extremely low values are needed. Ceramic caps typically range in value from 1pF up to nF, but in some cases and styles this will vary. They are commonly marked in pF such as p , or a multiplier is used such as , meaning pF - 10 plus one zero. They are unstable with both voltage and temperature, and the instability depends on the particular ceramic formulation. They should never be used to couple or filter signals, but their very low internal impedance makes them ideal for bypass applications. These are available in many different materials. Polyester is one of the most popular capacitor types, and these combine predictable size, especially the MKT and MKP polypropylene types, with good performance. MKT caps use various different markings, and it takes some familiarity before you will feel completely comfortable. We will use a 47nF 0. This could be marked as k, k63, or 47n. The third digit is a multiplier, and indicates the number of zeros to give the value in pF. Other plastic film materials will be seen, such as polystyrene, PET same as plastic drink bottles and Mylar. Electros are polarised, and the negative terminal is marked clearly on the case. Non-polarised electrolytic capacitors are also available, and are common in budget loudspeaker crossover networks because they are cheap and have high capacitance per unit volume. Another form of polarised capacitor. Theoretically unaffected by zero bias voltage, I and many others have found them to be unreliable regardless of usage. Some tantalum caps are colour coded - I do not propose to discuss these any further, so if you use them, you will have to figure out the markings for yourself. Close tolerance types e. If you have a capacitance meter, it is far cheaper to buy more than you need, and select them yourself. Electrolytics are also affected by age, and as they get older, the capacitance falls. Modern electros are better than the old ones, but they are still potentially unreliable at elevated temperatures or with significant current flow AC, of course. This is often quoted in datasheets, and an ESR tester is the quickest way to find out if an electro is on the way out. ESR rises sometimes quite dramatically as the capacitor ages, and is a better indicator of impending failure than measuring the capacitance. Although some of the types listed below are not especially common, these are the most popular of the capacitors available. There is a school of thought that the differences between various dielectrics are audible, and although this may be true in extreme cases, generally I do not believe this to be the case - provided of course that a reasonable comparison is made, using capacitors designed for the application. This makes the capacitor much smaller than would otherwise be the case. Probably the most linear low value capacitor, these are most commonly used in RF applications where the dielectric losses would preclude other types. They are physically large and comparatively expensive. Very good electrical properties, including exceptionally high dielectric resistance. Very linear and stable, but physically large. Polystyrene is affected by many solvents, and is unsuitable for high temperatures. Excellent high frequency performance, but not stable with temperature except NP0 aka G0G types. The temperature sensitivity is often used to stabilise RF oscillators. Very good bypass caps for high speed opamps. Commonly available in voltages up to 3kV or more. Designed as bypass capacitors, these are physically small, and have excellent HF performance. Stability is suspect, and they are not recommended for use in the audio path. Must not be used in filters because of thermal instability. Stable and reliable, but generally only low voltage up to V. Suitable for all audio applications, as well as bypass on power amplifiers and opamps. The name comes from the originals, which were green. Available in relatively large values, and excellent for passive loudspeaker crossover networks. Said by some to be audibly superior to other plastic film types personally, I doubt this claim. Polyethylene Terephthalate - the same stuff that plastic drink bottles are made from. Used in many different types of plastic film caps, often replacing polyester or Mylar Electrolytic: Using plates of aluminium and an electrolyte to provide conductivity, these caps use an extremely thin layer of aluminium oxide created by anodising as the dielectric. This gives very high capacitance per unit volume, and electros are used as coupling capacitors, filter capacitors in power supplies, and anywhere where a close tolerance is not needed, but high capacitance is necessary. They have a maximum current rating which must not be exceeded, and can be somewhat unreliable. There are no alternatives. These are IMO a better alternative than Very high capacitance per unit volume, but probably the most unreliable capacitor ever made. I do not recommend their use unless there is no alternative this is rare. Some designers love them why? Two polarised electrolytic capacitors in series, with the positive or negative terminals joined internally. These are often used in crossover networks, and offer low cost and small size. They are sometimes useful in circuits where a high value cap is needed, but there is little or no polarising voltage. I have found no problems with them in this application, but distortion may be an issue in some cases. In low voltage circuits, standard electros can be used, even with no polarising voltage. These were used many years ago, and can still be found as motor start and power factor correction capacitors. They are extremely rugged, and are self-healing. They do not fail as a short circuit - any arc is extinguished by the oil, and the cap can continue to function normally after the excess voltage is removed. This is only a basic listing, but gives the reader an idea of the variety available. The recommendations are mine, but there are many others in the electronics industry who will agree with me as well as many who will not - such is life. Apart from the desired quantity of capacitance, capacitors have some unwanted features as well. The resistance is referred to as ESR Equivalent Series Resistance , and this can have adverse effects at high currents e. Although it exists in all capacitors, ESR is generally quoted only for electrolytics. ESL equivalent series inductance is rarely provided. An inductor is most commonly a coil, but in reality, even a straight piece of wire has inductance. Winding it into a coil simply concentrates the magnetic field, and increases the inductance considerably for a given length of wire. Although there are some very common inductive components such as transformers, which are a special case , they are not often used in audio. Small inductors are sometimes used in the output of power amplifiers to prevent instability with capacitive loads. Transformers are a special case of inductive components, and are covered separately. Even very short component leads have some inductance, and like capacitance, it is just a part of life. Mostly in audio, these stray inductances cause no problems, but they can make or break a radio frequency circuit, especially at the higher frequencies. A 10mm length of 1mm diameter wire has an inductance of about 6nH, or nH for mm. As wire diameter is decreased for a given length, inductance is increased. An inductor can be considered the opposite of a capacitor. It passes DC with little resistance, but becomes more of an obstacle to the signal as frequency increases. There are a number of different symbols for inductors, and three of them are shown below. Note that pure iron is rarely if ever used, since there are various grades of steel with much better magnetic properties. The use of a magnetic core further concentrates the magnetic field, and increases inductance, but at the expense of linearity. Steel or ferrite cores should never be used in crossover networks for this reason although many manufacturers do just that, and use bipolar electrolytic capacitors to save costs. The typical range is from a few micro-Henrys up to 10H or more. Although inductors are available as components, there are few if any conventions as to values or markings. Some of the available types may follow the E12 range, but then again they may not. The range of inductances is generally far more limited than those for capacitors, but they can be wound for any inductance desired. Like a capacitor, an inductor has reactance as well, but it works in the opposite direction. The formula for calculating the inductive reactance XL is What is the inductance? As before, cover the wanted value, in this case inductance. Like the capacitor there is phase shift, so when inductive reactance equals resistance, the response is 3dB down, and not 6dB as would be the case with two equal resistances. Like a capacitor, an inductor in theory dissipates no power, regardless of the voltage across it or the current passing through. In reality, all inductors have resistance, so there is a finite limit to the current before the wire gets so hot that the insulation melts. An inductor with high resistance has a low Q, and vice versa. I do not propose to cover this in any more detail at this stage, and most commercially available inductors will have a sufficiently high Q for anything we will need in audio.

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Chapter 4 : Electrical Engineering Guides [part 3] | EEP

The Beginner's Guide to Engineering: Electrical Engineering by Mary Ellen Latschar The Beginner's Guide to Engineering series is designed to provide a very simple, non-technical introduction to the fields of engineering for people with no experience in the fields.

The purpose is the same: Literally, a circuit is the path that allows electricity to flow. This guide will show you a few of the common symbols that you are sure to see in your future electrical engineering career. Outlets in other countries operate at a different voltage, which is why you need a converter when traveling. Current is the flow of electricity, or more specifically, the flow of electrons. It is measured in Amperes Amps , and can only flow when a voltage supply is connected. Materials such as gold or copper, are called conductors, as they easily allow flow of movement low resistance. Plastic, wood, and air are examples of insulators, inhibiting the movement of electrons high resistance. DC is a continuous flow of current in one direction. DC can flow not just through conductors, but semi-conductors, insulators, and even a vacuum. In AC, the flow of current periodically alternates between two directions, often forming a sine wave. The frequency of AC is measured in Hertz Hz , and is typically 60 Hz for electricity in residential and business purposes. Completing an electrical engineering degree and then getting a job in the field means you will see a lot a lot a lot of these schematics. While they can and will get very complex, these are just a few of the common graphics to get your footing on. Starting to make sense? These are the basics and may even seem obvious or intuitive to you, such as the wires and if they are connected. Whenever you determine your specific field of electrical engineering, you may see more complex diagrams and symbols. For example, of the two symbols for resistors above, the first one is used in the U. You will also learn about the various symbols used for switches, other power supplies, inductors, meters, lamps, LEDs, transistors, antennas, and much more. As mentioned earlier, these symbols and schematics will be all over the place. The sooner you familiarize yourself with the verbal and pictorial languages of engineering, the more prepared you will be in your quest for a degree.

Chapter 5 : A Beginnerâ€™s Guide to Circuit Diagrams Â» Electrical â€‹Engineering â€‹Schools

These questions relate to the quality of a measurement. When talking about measurement quality, it is important to understand the following concepts: precision, accuracy and uncertainty, repeatability and reproducibility, tolerance, traceability and calibration etc.

Chapter 6 : Beginnerâ€™s guide to measurement in electrical engineering | EEP

guide will equip you with the guiding principles and good practice to measurement in electronic and electrical engineering. The IET: working to engineer a better world.

Chapter 7 : Beginners' Guide to Electronics, Part 1 - Basic Components Explained

Complete DC Machines Course for Beginners in Electrical Engineering: This is the First course in series of Electric Machines for Electrical Engineering students, explained as simple as possible.