**Chapter one**

**Introduction**

* 1. **Background of Study:** In recent times soldering was a hard task as normal soldering irons were made to operate base on the output power from the mains. Soldering of electronic components like resistor, diode, inductor, capacitor etc, is as important as the component itself, these components are connected together to build electronics used in home, offices and industries. many electrical component have different temperature rating and can go bad within a temperature range higher than that specified by the manufacturer, since soldering in electronics is the process of using melting soft solder (a fusible metal alloy) to join these different component by applying heat then there is close contact between these delicate electrical components and the device that applies the heat (soldering iron). To avoid this many electrical and electronics technicians use more sophisticated material like heat absorber, and heat trapping devices in other to prevent the excess heat from getting to the component being soldered. Thinking of which, while trying to prevent the components from getting heated up, it then posses a great deal of technical know how of the user and more time spent doing the job at hand. Therefore it is now clear that if we can control the temperature from the soldering iron then there would be no need subjecting the user to a more strenuous activity of using heat trapping devices on the component before soldering. The substance being melted (soft solder) has a melting point of about 188 degree Celsius, if the soldering iron is controlled and made to work within this temperature range then nearby components and those being soldered will not be affected by heat. To achieved this, we needed something that can control the soldering iron temperature, here we used the Arduino microcontroller board. The Arduino microcontroller board is a development board that houses an AVR chip which allows instruction in form of programs to be uploaded into it in order instruct it on how to behave. With the arduino we can then write programs into it, this program will then be used by the arduino to control the heating of the soldering iron, when a user wants to use the soldering iron, the user chose a specific temperature by turning a knob then the arduino detects the input and depending on the input the arduino either raise the temperature of the soldering iron or decreases it. With this then we have a soldering system in which the temperature can be controlled by the user.
  2. **Objective of Study:** the main purpose of this work is to design a soldering system in which the temperature can be controlled by the user by turning a knob or pressing a button found on the device. This device is implemented to ease the control of heat spread amongst electrical components when soldering work is done.
  3. **Significance of Study:** this work is highly need by circuit designer, electronic engineering and other profession where soldering of electrical component is done. Without good soldering technique then building circuit would be a problem because of high amount of heat introduced during soldering. Components like resistors, diodes, inductor and integrated circuit are delicate and can malfunction when excess temperature is been applied to the terminals or around them.
  4. **Scope and Limitation of Study:**  this project work is design for electronic engineers who know how to solder and also the maximum temperature that a user can select is 450 degrees Celsius and the solder being considered in this project is the soft solder as it is mostly and commonly used type for electronic circuit design. This project was tested in a normal environmental condition therefore climatic changes was not considered, also this project was done using a 220 volt mains as power source.
  5. **Definition of Terms:** Terms used mostly in this project are defined here unless stated otherwise in other context:

**Solder:** Solder is a fusible metal alloy used to create a permanent bond between metal work pieces. It is use as substance to create joining between different components like resistor, capacitors, inductor and integrated circuits to the circuit board or to another component.

**Microcontroller:** A microcontroller is a small computer on a single integrated circuit. In modern terminology, it is similar to, but less sophisticated than, a system on a chip or SoC; an SoC may include a microcontroller as one of its components. The microcontroller for this project is AVR, it is found embedded into the Arduino development board.

**Arduino Uno:** The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button.It is our main controller or brain of this project. In this project is used to receive users input and then sends output to the soldering iron on how it should operate.

**Capacitor:** It is a passive electronic component that stores energy in the form of an electrostatic field. In its simplest form, a capacitor consists of two conducting plates separated by an insulating material called the [dielectric](http://whatis.techtarget.com/definition/dielectric-material). The capacitance is directly proportional to the surface areas of the plates, and is inversely proportional to the separation between the plates. Capacitance also depends on the dielectric constant of the substance separating the plates.

**Integrated Circuit:** An integrated circuit (IC), sometimes called a chip or microchip, is a semiconductor wafer on which thousands or millions of tiny resistors, capacitors, and transistors are fabricated. Its function as a timer, counter and memory.

**Printed Circuit Board:** A rigid flat board that holds chips and other electronic components. The board is made of layers typically two to ten that interconnect components via copper pathways. The design transferred to a copper clad board for correct and accurate placement of components.

**Soldering Iron:** It is a hand tool consisting of a handle fixed to a copper tip that is heated electrically and used to melt and apply solder.

**Transistor:** It regulates current or voltage flow and acts as a switch or gate for electronic signals. A transistor consists of three layers of a semiconductor material, each capable of carrying a current. A semiconductor is a material such as germanium and silicon that conducts electricity in a "semi-enthusiastic" way.