Project List and Some Guidelines

Welcome to the project part!

We prepared 8 projects for you, which are listed on page 2-6. Each project can be chosen by at most 8 teams. Also you can also design a project on your own, and you should write an email to introduce your project proposal to your TA before next Tuesday (Nov 29th). We will discuss whether your project proposal is acceptable or not. So you should make sure that your project is quite cool and has similar complexity with those project we provide. Besides, there are some requirements you need to know:

1. Your circuit must be welded on the PCB that we will provide.
2. You must simulate the circuit and send the result to your TA before building the circuit on the PCB.
3. You should buy the components on your own and make sure the total price is less 100 RMB. You must pay enough attention to the notes about invoice at the bottom.
4. The template for the project report will be available next week, you must use it to write your report.
5. The whole work should be done by yourselves. TA will track your progress and the results will affect your final grades.

We will determine the list in time order if one project is chosen by more than 8 groups, and those unlucky guys will get message if they need to choose again. In the Project part, you may have a new TA according to the project you choose. You should send an email to the corresponding TA when you decide to choose some project. If you want to design the project by yourselves, you just need to send an email to your present TA. Next week we will arrange new lab time for you to do the project.

Project plays a very important role in your electronic courses. We hope you use what you learn in this course to finish your project. The process of doing a project is not easy, but you will learn much practical knowledge beyond course lectures.

At last, wish you a good time.

The Lab TA Group

发票要求

1. 不超过 100 元；
2. 发票抬头：上海科技大学
3. 只接受机打发票；
4. 要写明细，没有明细的需附元件清单；
5. 不能刮奖。

Project 1 Recycling Lighting LED

TA: Huangjl@shanghaitech.edu.cn

In this project, you need to design circuits to illumine 4 LEDs – LED-A, LED-B, LED-C and LED-D. Let these four LEDs illumine one by one and recycling, but in the same time only one LED is illumined.
You should do:

1. Firstly, find out the circuits schematics and run simulation in Multisim. (40%).
2. Secondly, buy some components and devices used in your circuits, and work with your TA to find out which components are already available in laboratory (like resistors and capacitors).
3. Thirdly, build your circuits in the provided multi-holes board, debug and run your circuits. (40%).
4. Finish the midterm-report and final-report (one for a team). In your report, write clearly the work done by each team member. (20%).

You can only use components and devices such as J-K flip-flop, 555 timer, resistors and capacitors. Never use any microcontroller like 51, PIC …
In your reports, your need to write clearly the reference paper or websites you find and referred to in your design, and the differences from your own work.

Project 2 Frequency Multiplier and Divider circuits

TA: Huangjl@shanghaitech.edu.cn

In this project, you should design circuits to realize a frequency multiplier and a frequency divider. The original frequency (f) can be created by a crystal oscillator, like around 11MhHz. Then the output signal frequency will be 2f, 4f, 8f, or 0.5, 0.25f, 0.125f by open or closed different switches.

You should do:

1. Firstly, find out the circuits schematics and run simulation in Multisim. (40%)
2. Secondly, buy some components and devices used in your circuits, and work with your TA to find out which components are already available in laboratory (like resistors and capacitors).
3. Thirdly, build your circuits in the provided multi-holes board, debug and run your circuits. (40%)
4. Finish the midterm-report and final-report (one for a team). In your report, write clearly each teammate's work. (20%)

In your reports, your need to write clearly the reference paper or websites you find and use in your design, and the different part in your own work.

Project 3 Temperature Detection and Alarm System Design

TA: chenchen2@shanghaitech.edu.cn

In this project, you need to design a temperature detection and alarm system. Temperature sensor detecting the change of temperature transforms the temperature signal into electric signal to make the buzzer work when the temperature is higher than 70℃. When the temperature is lower than 60℃, relay controls heater for heating, and light emitting diode.

1. First of all, design the schematic of whole system and state the function of each part. (40%)
2. Secondly, buy some components and devices used in your circuits, and work with your TA to make sure which components are already available in laboratory (like resistors and capacitors).
3. Thirdly, build your circuits in the provided multi-holes board, debug and run your circuits. (40%)
4. Finish the midterm-report and final-report (one for a team). In your report, write clearly each teammate's work. (20%)

Components can be used: LM7812, LM317, LM324, LM393, RT100, 8550, 8050, RT100 and so on.

In your reports, your need to write clearly the reference paper or websites you find and used in your design, and the different part in your own work.

Project 4 Digital Thermometer

TA: chenchen2@shanghaitech.edu.cn

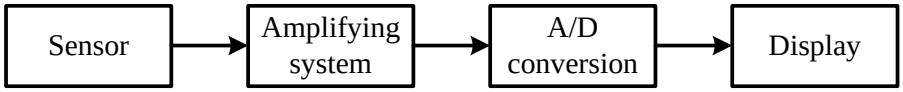
In this project, you will design and manufacture the digital thermometer with the small scale integration chip, namely the measured temperature with digital display. The specifications are listed below:

1. The measuring range is 0-200 centigrade.
2. Measurement accuracy is 0.1 degree.
3. 4-bit LED digital tube display

You need to do:

1. First of all, design the schematic of whole system and state the function of each part. (40%)
2. Secondly, buy some components and devices used in your circuits, and work with your TA to make sure which components are already available in laboratory (like resistors and capacitors).
3. Thirdly, build your circuits in the provided multi-holes board, debug and run your circuits. (40%)
4. Finish the midterm-report and final-report (one for a team). In your report, write clearly each teammate's work. (20%)

The principle diagram:



Components can be used: LM35, LM324, CC7107, LED and so on. Never use any microcontroller like 51, PIC …

In your reports, your need to write clearly the reference paper or websites you find and used in your design, and the different part in your own work.

Project 5 DC Step-Up Converter

TA: lichen@shanghaitech.edu.cn

In this project, you will design, simulate, verify and analyze an DC step-up converter, which boost low DC voltage to high DC voltage.

The specifications are shown below, and you need to meet at least three of them:

1. 90% efficiency;
2. 10 times of voltage gain;
3. 100W power;
4. constant output voltage;
5. 1% output voltage ripple;
6. 1% output current ripple;

PS: Other requirements are also accepted if you passed TA's check, workload is the key element.

From this project, you need to do and will learn to:

1. Investigate the state-of-art and requirements for DC step-up converter;
2. Simulate and test your topology by MATLAB's SIMULINK module;
3. Select appropriate power electronic devices and build a feasible DC step-up converter;
4. Measure your converter's operating status by oscilloscope, differential probe, hall current probe;
5. Analyze basic power electronic circuits.

In your report, a) reference paper, b) simulation results, c) experimental results and d) theoretic analysis are all required. Also, the format of the final report (or presentation) is very important.

Project 6 Hello Robot

TA: liushb@shanghaitech.edu.cn

In this project, you need to design a store robot to meet the following requirements:

1. When a guest come in the store, the robot says "Welcome".
2. The robot can count the number of guests, and show the number with LED display device, like Digital tube.
3. The system should work steadily and reliably with an error less than 2 people.
4. If you need to use a MCU, 8051 Microcontroller is permitted.
5. You should try your best to build your circuit with basic components.

Project 7 Motor Controller

TA: chenchen2@shanghaitech.edu.cn

In this project, first you will design a motor controller to drive a DC motor or a stepper motor. Then you need to design something interesting with the motor.

Minimum requirement

The minimum requirement is to drive a DC motor or a stepper motor. For DC motor, it can have several rotational speeds controlled by the keys and showed on digital tubes. As for stepper motor, it can be controlled with keys to realize specific rotational number both clockwise and anticlockwise. Finish this, you will get pass your project section in the course.

If you want to get higher scores, you need to do some fun work. Some options have been provided below.

Options

Any one of the followings is a plus:

1) You can assemble your motor and controller into a toy car. To do this, you need to buy a chassis.
2) You can design your PCB if you want.
3) Some other functions which could demonstrate your hard work.

Project 8 Stereo Tone Controller

TA: caoqi@shanghaitech.edu.cn

Briefly, in this project you need to design a stereo tone-controller. That means, the circuit will be able to adjust the base and treble part of the stereo sound in each channel. Specific requirements are in a separate file named “Stereo Tone Controller.pdf”.