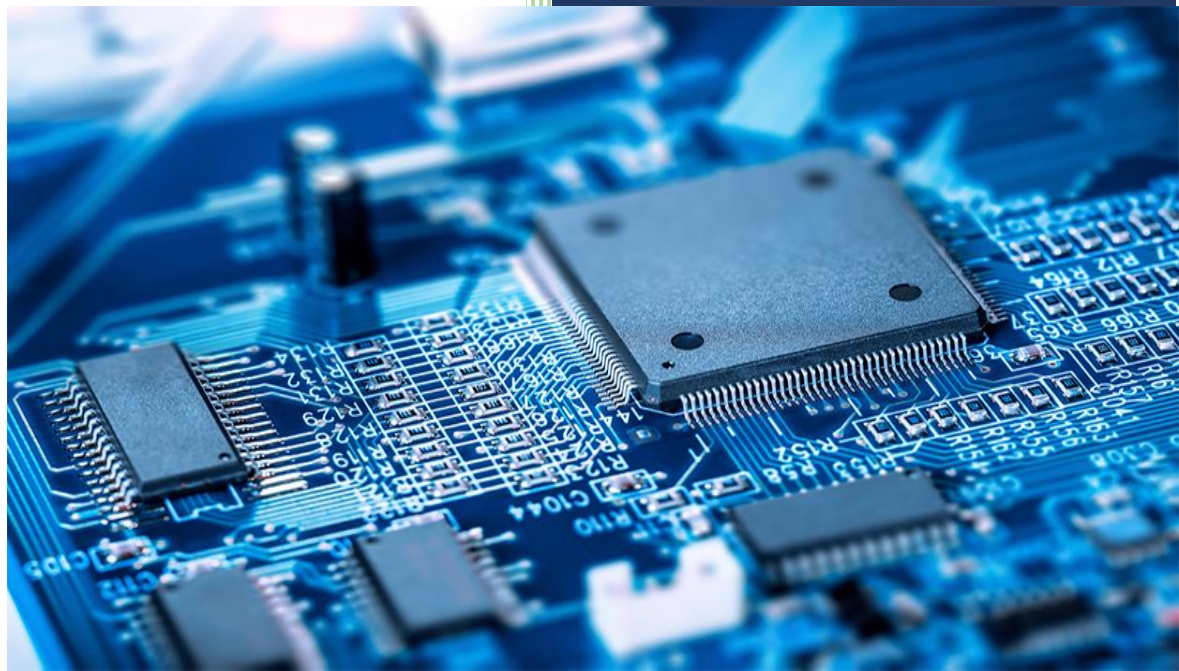


Fall 2019

# Project Manual



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Fall 2019

## Purpose

In this project you are to use and apply all techniques and skills acquired during this semester.

Moreover, the project requires of you to acquire and apply new knowledge of a new component not covered during lab sessions or course lectures: the **555 timer**.

## Project Description

The TV Sitcom “The Big Bang Theory (TBBT)” introduced a “Rock, Paper, Scissors, Lizard or Spock (RPSLS)” game which is an extension of the classic rock-paper-scissors hand game played between two players.

In the RPSLS hand game, each player chooses one of five options: rock, paper, scissors, lizard or Spock. The winner, if any, is determined by a set of rules that rank the “power” of each option in a way that no single option is a guaranteed winner.

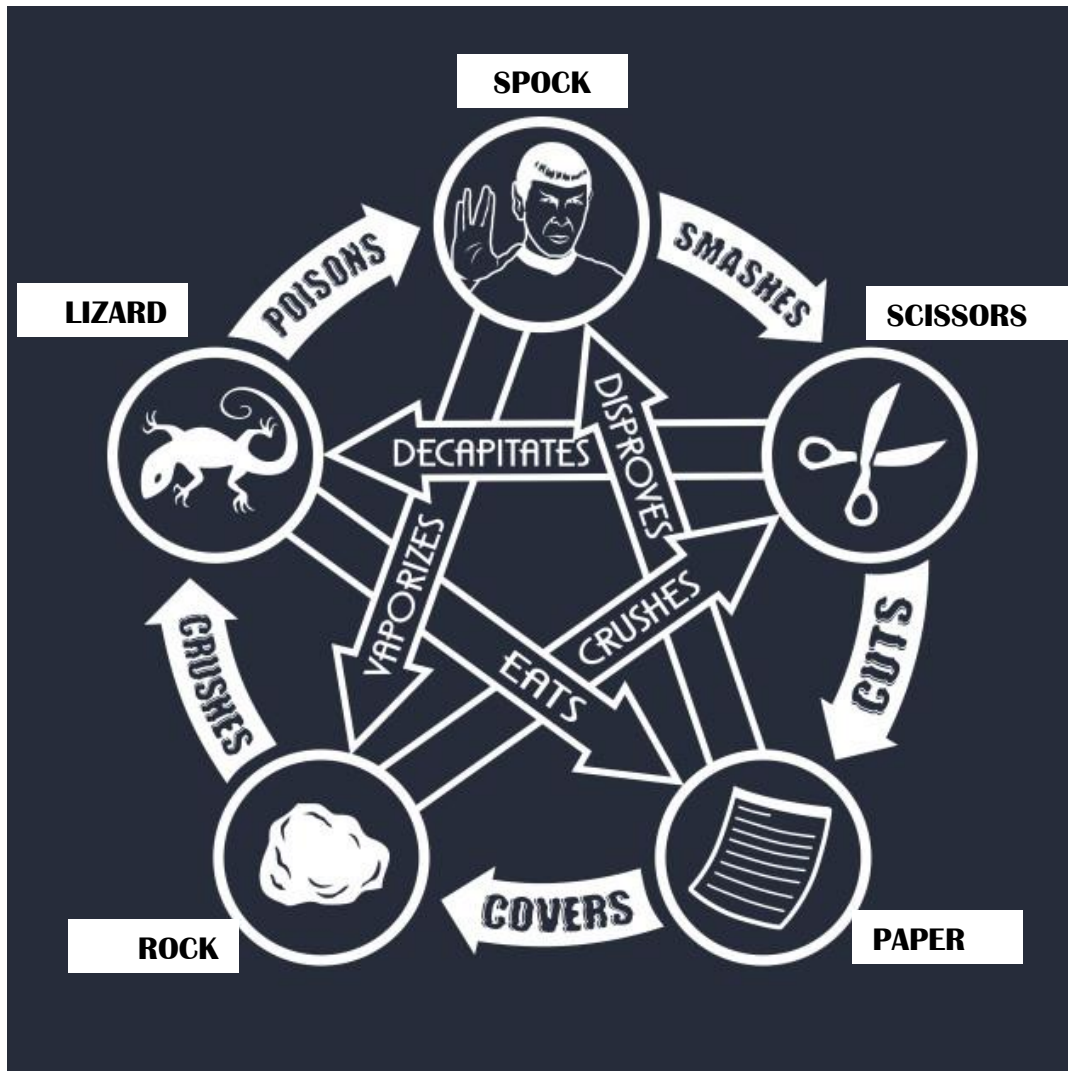
The purpose of this project is to implement the game by the means of a digital circuit, allowing two players to play the game where the results are determined automatically and displayed on 7-segment displays.



➤ **Game rules**

The players should play 3 rounds, where the winner is the one who wins 2 or more rounds.

The winner of the round is determined based on the following diagram.



The results are displayed on a 7-segment displays announcing the winner as soon as they're determined.

➤ **Inputs**

Consider that every player has a set of 5 push buttons. Each of the buttons is labeled as rock, paper, scissors, lizard, and spock.



*Partial grades will be given for those who use switches instead*

➤ **Led lights**

A set of 5 led pins for each player are used in order to show their choice.



*Color is not important*

### ➤ 7 Segment Display

Three 1-digit 7 segment display should be used to show the following:

- The first 7 segment displays the choice of the winner according to the following table:

Output	Display
Starting phase	-
Rock Wins	A
Paper Wins	P
Scissors Wins	S
Spock Wins	C
Lizard Wins	L
Draw	0

- The second 7 segment displays the winner of the round according to the following table:






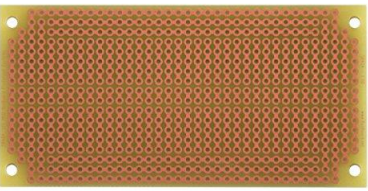
Output	Display
Starting phase	-
Player 1	1
Player 2	2
Draw	0






- The third 7 segment displays the winner of the game according to the following table:

Output	Display
No winner	-
Player 1	1
Player 2	2



➤ **Components:**

Item	Quantity	Image
push buttons or switches.	10	
LEDs	10	
1 digit 7-segment display	3	
Soldering iron	1	
Solder iron wire	1	
Solder breadboard	Based on your need	

Voltage source.	1	
Wires	Based on your need	
555 timer	1	
Resistors and capacitors if needed.	Based on your design	
IC chips	Based on your design	

## Design steps

You should work on the following:

1. Clearly show your analysis
2. Clearly identify your inputs and outputs
3. Write down the truth table of the design
4. Use any minimization technique to get the minimized form of your outputs
5. Draw the paper design
6. Build your design on Quartus, simulate and analyze the results
7. Build the design on breadboard and solder it
8. Pack your design in a nice way

## Project report

The report should include the following:

1. Abstract
2. Introduction
3. Components and equipment used
4. Analysis
5. Paper design
- 6. Research on the 555 timer used for creating a clock signal**
7. The circuit used to build the clock
8. Quartus Design and analysis
9. Bread board design and analysis
10. Financial study, trying to minimize the cost of your design
11. Delay calculation
12. Power consumption
13. Problems faced
14. Key points in the design that present an advantage compared to other designs

## Important tips

- Building your own clock using the 555 timer is mandatory
- Soldering should be clean
- Use Chip chair for soldering to make sure the solder will not burn the chip
- Packing the design in a nice way will give you extra points
- Divide and Conquer: Divide the design into small parts. Operational parts will provide you with partial grades even if the complete design is not fully working



## **Team Work**

You can work together in groups of 3 or 4 of your choosing.

Any resemblance to any other teams' work will result in a zero on both projects.

## **Deliverables**

- Your system should be soldered on circuit boards (do not use printed circuit boards).
- Every team will present one report. The report should be well organized and should include all design steps, decisions, assumptions and analysis, as well as the theoretically simulated design on Altera Quartus II.

## **Demonstration**

The work of each group will be presented in the presence of all members who should be prepared for any question regarding the design and implementation.

## **Due Date**

Tuesday December 21 starting 9am in the Lab.

*Note: This project reflects 20% of the lab's total grade (15% common to the whole team and 5% individual effort).*