



## BBM 434 – Embedded Systems Lab

### Lab 6 Instructions

### - Homemade Serial Synchronous Communications -

#### Preparation

You will complete this lab by collaborating with another group as you will need two Launchpads. You will also need one Nokia 5110 LCD display for this lab.

#### Purpose

You will design and implement your own serial communications protocol. There will be a hardcoded string in the master and you will transmit it to the slave. Slave will display the string on the Nokia LCD.

#### System requirements

One of your launchpads will be the master and the other one will be the slave. Connect two launchpads as described below. Do not forget to activate pulldown resistors for the slave input pins.

#### Implementation

On the master, configure the TX pin and the CLK pin as GPIO output. On the slave, configure RX and CLK pins as GPIO input. Connect the GND pins of the master and slave. Connect the Nokia LCD to the slave.

Master sets the clock. Setup a SysTick timer and toggle the CLK pins at each tick. Essentially, you will have a square wave output from the CLK pin.

On the rising edge of the CLK, master sets the next bit to the TX port and keeps it at that level till the following rising edge.

Setup falling edge interrupt for the CLK pin of the slave. On the falling edge, read the next bit from the RX pin.

Master has to send each char bit by bit. At each rising edge, you have to send a bit of your char array. Char arrays in C are null terminated, i.e. there is a null character at the end. Send the null character to signal the end of the string.

Try to speed up your transfer. To measure the speed, you may want to experiment with a longer string. Check the correctness of the string at the slave.

**Discuss the following in your reports as well:**

What is the maximum transfer speed in byte/s that you can transfer your string accurately? What do you think limits your transfer limit?

## What You Need to Include in Your Report

As usual, you need to include all the steps of your implementation in your report. Include the parts of your code with necessary explanations of your implementation. **You must also submit the entire projects with all the codes for both master and slave implementations**, along with the written report.

**For this lab, only one report per two collaborating groups need to be submitted!**

**Each group must contribute to the report by explaining their role and codes (master or slave).** You may use overleaf or Google Documents to collaborate on the same document without having to be all in the same place at the same time.

## How to Submit a Written Report

The deadline for the submission is **Friday 26 April 2019 until 13:45** (no further extensions will be allowed!). Submit your work through <http://submit.cs.hacettepe.edu.tr/> (submission via e-mail will not be accepted!) in the following format (**one submission per two collaborating groups**):

- **b<studentID>.zip**
  - **report.pdf**
  - **masterprojectcodes.zip**
  - **slaveprojectcodes.zip**