

## EC415 Final Project Part A: MATLAB

### Individual Contributions:

Gerard wrote the MATLAB code for letters2QPSK.m. QPSK\_modulation.m was completed as a team over a video conference. Both Gerard and Mario contributed.

### letters2QPSK.m

This file implements a function which takes in an ASCII string and converts it into an array of QPSK symbols. First, the file converts the string into an array integers representing their ASCII values and then into binary representation. Next our function appends a leading 0 to each row to make it 8 bit binary representation. Then, it transforms the matrix into a single row, continuous array. Finally it steps through the array 2 bits at a time (because M=4 need 2 bits to represent 4 symbols) and uses a case statement to convert the bits into a QPSK symbol. As it steps through the ASCII binary array and computes its corresponding symbol, it appends the symbol to our QPSK output array. Below, you can see the output when the input to the function is 'AB'. It matches the example.

```
>> letters2QPSK('AB')  
  
ans =  
  
Columns 1 through 4  
  
0.0000 + 1.0000i    1.0000 + 0.0000i    1.0000 + 0.0000i    0.0000 + 1.0000i  
  
Columns 5 through 8  
  
0.0000 + 1.0000i    1.0000 + 0.0000i    1.0000 + 0.0000i    0.0000 - 1.0000i
```

### **QPSK\_modulation.m**

First, this script uses letters2QPSK.m to convert the message 'EC415' into QPSK symbols. Then, it applies the pulse shape to the symbol message. We were able to do this by modifying pulshape.m code. It uses the rectwin() function to create the rectangular pulse shape and then convolves it with the message to create the baseband signal. apply the rectangular pulse shape to our message. Finally, it mixes the baseband signal with the carrier signal to create our passband modulated signal. It multiplies the signal by both cosine and sine and subtracts the sin product from the cos product to create our passband signal. Below, you can see our results. You can see both the real and imaginary components of the baseband signal and the modulated passband signal.

