



Course Mini-Project

Implementation of a Digital Modulation

Project Objectives:

1. Apply experimentally the theoretical concepts studied in the course.
2. Simulate the performance of modulation schemes
3. Get familiar with MATLAB as a fundamental tool for communications and signal processing engineering

Project Description:

It is required to implement the following system:



One of the digital modulation techniques will be used in the Mapper design. The channel is modeled as a simple AWGN channel. MATLAB (not SIMULINK) will be used for implementation, without the use of the built-in functions of the communications toolbox.

Requirements

1. Generate a random stream of bits and pass it through your modulation scheme. The Signal to Noise ratio (SNR) in dB takes the values {30, 10, 5, 0, -3 dB}.
2. Sketch the constellation diagram of the signals at the input and output of the AWGN channel (at the predefined SNR values).
3. Comment on the resultant noisy constellation in part 2.
4. Plot the relation between the BER vs. E_b/N_0 in dB where E_b is the bit energy and N_0 is the noise spectral density. Assume E_b/N_0 takes values from -10 dB to 20 dB with step 5 dB, **note:** the BER is measured by comparing the bits detected at the output of the demapper with the transmitted bits.
5. Plot the theoretical relation between BER and E_b/N_0 in dB for your modulation scheme vs. the simulated one in part 4 and comment.

Deliverables

1. All the M-files you used in your simulations.
2. A document describing your work and containing the plots mentioned above. You should include any formulas you have used while working and the formulas for the theoretical BER curve.
3. Include a cover page with your full name.
4. Please note that the document will only be accepted in **PDF** format.

Rules:

1. It is not allowed to copy codes from other groups, or from the internet. Otherwise, you will not get a zero, but you will get negative marks.
2. Every student in the group should have an equal contribution in the project, and at the same time be aware of the work of all other members.
3. Groups will be formed of 5 students, and each groups will randomly be selected to implement on the following techniques:

Group	Modulation Technique
1	QPSK
2	Offset QPSK
3	8-PSK
4	16-PSK
5	32-PSK
6	64-PSK
7	128-PSK
8	256-PSK
9	512-PSK
10	8-QAM
11	16-QAM
12	32-QAM
13	64-QAM
14	128-QAM
15	256-QAM
16	512-QAM
17	BFSK
18	MSK

4. The deliverables should be put together in one RAR archive.
5. Send your RAR archive to “**Rawda.Osama@hotmail.com**”, The subject must be **Dig.Comm.Project** and the body of your e-mail should mention your group number.
6. The deadline for this assignment is 20/12/2017. Late project will not be accepted.