Project for the subject Digital Communication

The input file is to be communicated via a noisy channel and received at the output.

1. Design and implement the source encoder.
2. Design and implement the QAM scheme in such a way that the expected power is minimized. (Hint: Use the symbol probabilities to design the QAM. Assume the noise in the channel is additive. The process has zero mean and flat power spectral density. The baseband allocated bandwidth is 12 MHz. The expected error probability is at most 10^{-6}.
3. There is no inter-symbol interference (ISI).
4. Design and implement the receiver.
5. Design and implement the source decoder to retrieve the file back.
6. Compute the expected error probability. What should be the number of expected errors in the file after source decoding?
7. Count the number of errors in the file after source decoding.
8. Compare the expected number of errors with the actual number of errors.
9. Assume the SNR_b (signal to noise ratio per bit) to be i) 5 dB, ii) 10 dB and iii) 15 dB for three different cases. Plot the expected error probability vs. the SNR_b. Plot the actual error fraction vs. the SNR_b. Use different legends for the above two cases in the same plot.

Input file: 'The_Hound_of_the_Baskervilles.txt', 'Lena.bmp'
Noise distribution: Gaussian, Laplace
Total time constraint: < 30 ms for both the files.

What to submit?

1. A report with short point wise description of the design steps. **Clearly mention all the assumptions, results and plot the graphs** (in pdf format). Name of the report is **13EC*****.pdf.**
2. The code. Use separate functions (m-files) for separate blocks. Provide required comments such that the code is readable (all files should be compressed in a single rar file). Name of the file is **13EC*****_code.rar.**
3. The decoded file.
4. The error file.
5. All the above files should be combined into a single rar file named **'13EC*****.rar'.**

Rules:

1. This project contains 20 marks. The approach, correctness, report and result will contain marks.
2. Plagiarism will give **0** to all the students involved. If you don't understand something, you may discuss with me. But no copy-paste is permitted in assumptions, code, and report.
3. Deadline of submission is **20th April, 2016**. Further delay will reduce 5 marks/day.
4. All submissions should be made to my email id '**ritwik.ece.iitkgp@gmail.com**'. Every student should send just one email. So, send it after you are sure about its correctness.
5. **AWARD**: The best three designs with the least (Total time* number of actual errors) for the text file and the 10 dB SNR_b (Gaussian noise) will get a treat from me.