ENG3014 Communications Systems 3:
Communication Channel Simulation and Report

In this project, you will complete a simulation of a wireless communication system. This builds on the tasks in Lab 1 and the lectures cover all the background theory for each part of the task.

This should include at minimum:

- A message of your choice, comprising more than 2048 bits, converted from a "STRING" to a "BINARY".
- Using your modulation format of choice, modulate a carrier to encode this information.
- The channel SNR to be considered will be 6dB, 18dB and 24dB with respect to AGWN.
- An output filter limiting the transmitter bandwidth to less than 20% of the carrier frequency.
- Demodulation of the signal and recovery of the signal. Please analyse the Bit Error Rate of the received signal over multiple retransmission of the signal over the simulated channel.
- Discuss in your report choices you make, such as modulation format, Baud Rate, Filter type and bandwidth.

Up to 30% of the marks allocated will be included for creative additions (10% each), these could include:

- Simulate fading conditions associated with an urban environment. Implementation of Hamming coding or other error correction technique.
- Transmission of video, audio or other time varying signal over the channel.
- Dynamic modulation, based on measured system performance.
- Automatic resending of errored signals.
- Or anything else you think would be a cool addition!

To be Submitted:

1. <u>One 3-page report covering:</u>
    - Overview of simulation approach.
    - Background including short overview of modulation formats and fading models used. Please include any relevant background for your creative additions.
    - Key results from the simulation, along with justification of the choices made during simulation.
    - Discussion and conclusions, highlighting key observations that could shape the development of a future wireless system.

2. <u>Fully commented code in either Python or Mathematica. Matlab can be used swell, but support can not be guaranteed.</u>

Marking breakdown:

- 20% for code and commenting.
- 20% for overview and background (including references).
- 20% for results and discussion.
- 10% for presentation quality, including properly formatted plots and diagrams explaining the approach taken
- 30% for creative additions to the channel simulation.