**Report - 2**

**Error Correction Codes and Error Detection Codes**

**Overview**

* This is an individual report.
* In this report, you shall investigate issues relevant to the error correction code and error detection code.
* The outline (and some requirements) of the report is listed below.

**Content**

* Cover page
  + Logo of UPRM, Title, Course, Student Name, Student ID, Department
* Table of content
* Introduction
* The basics
  + The definition of a valid codeword
  + The definition of a complete code
  + The Hamming distance between two codewords
  + The Hamming distance of a complete code
  + The error correction capability of a complete code
  + The error detection capability of a complete code
* Error correction code
  + Using Hamming coding to encode bit stream: 10011010010
    - Provide details (like the steps in the course video)
  + Explain the main idea of the LDPC code
    - Use a diagram to show how an input data block is encoded.
  + Explain the main idea of the polar code
    - Use a diagram to show how an input data block is encoded.
* Error detection code
  + Using CRC with general polynomial x4 + x3 + 1 to encode 111011011
    - Provide details (like the steps in the course video)
  + Explain how CRC is performed by hardware?
    - Use one diagram to explain the encoding process.
    - Use one diagram to explain the decoding process.
* Codes in standards
  + IEEE 802.11 Standard (the standard is in the references section in Moodle)
    1. In Chapter 9, find the polynomial used for CRC error detection.
    2. In Chapter 15, find the polynomial used for CRC error detection.
  + 5G NR Standard (a reference is in the references section in Moodle)
    1. How LDPC code is used in 5G NR standard?
    2. How polar code is used in 5G NR standard?
    3. Why is the distributed CRC used in 5G NR?
* Conclusions
* References
  + **Need at least 20 references (IEEE style)**.