TTT4130 Digital Communications 2026
PROJECT 1. Communication simulation

Department of Electronic Systems, NTNU

1. Goal

The students configure and simulate an equivalent complex baseband communication system.

2. Group work

- Groups of three, random population
- Joint report

Collaboration and discussion between groups are recommended. Regular rules regarding citation of sources.

3. Project 1 - Simulation of an equivalent complex baseband system

The students are provided a MATLAB livescript which serves as the main control hub for a Simulink baseband digital communication system. The livescript guides through the project with task descriptions and explanations. The following topics are covered:

- Nyquist pulses and symbol rate.
- Pulse shaping, transmit and receiver filters
- Bandwidth and power of signal
- Noise power and Signal to Noise Ratio (SNR), and E_s/N_0
- Bit-Error-Rate

3.1. Reporting

Upload to BlackBoard:

- Written report in english of **2 page max.** excluding references and figures.
- Completed MATLAB livescript.

- Additional project files.

Keep to the deadlines, no extensions.
Important parts of reports are:

1. Problem statement: describe the general project set-up.
2. Address tasks from the livescript with solutions and conclusions. Include relevant theory. Introduce performance metrics and any validation or verification methods you will use (Spectrum plots, constellation plots, eye diagram)
3. Reflection: overall reflection, conclusions, lessons learned.

The report template is available in BlackBoard. Please do not deviate from the structure unless you strongly feel it will improve the report.

3.2. Grading criteria (0-15pts)

- General quality: clarity, readability, structure (2pts)
- Relevant Theory to predict measurement results identified and explained (2pts)
- Documentation of design at a level that enables justification for theory (why the theory applies to the design) (3pts)
- Test design (3pts)
  - Choose and/or design tests to evaluate system characteristics (e.g. performance) and verify against requirements
  - Documentation of the test method for the quantity of interest.
- Result analysis (5pts)
  - Comparison to theory
  - Identification of deviations and unexpected results (wrt theory), eventually further tests to explain the results

4. Project support

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