

**Birla Institute of Technology & Science, Pilani,
Rajasthan**
First Semester 2021-2022
Lab-7 (PYTHON): AM and FM

Course: EEE F311 Communication Systems
Instructor-in-Charge: S M Zafaruddin

12-10-2021 TUESDAY (P2, P4): PYTHON

Instructions

- Create a folder named Lab in your shared folder.
- Create a Lab7 Sub-folder in the Lab folder. This folder will be your working directory.
- Develop .py file corresponding to each task.
- You can start the tasks in any order.
- Once all tasks are done, paste your codes and plots/results/observations/conclusions in a word doc and upload through a Dropbox file request link. The link will be shared through Slack.
- Best of Luck

Objectives

In this task, the objective is to study real time transmissions of modulated signals over a channel with additive noise.

Python Task 1

Generate message signal $m_1(t) = A_m \cos 2\pi Nt$, where $A_m \sim U(1,10)$ and a carrier signal $c(t) = \cos(2\pi f_c t)$. Take $f_c = 100$.

- Plot (time and frequency) the SSB signal using the real time code for 10 seconds.
- Plot (time and frequency) FM signal using the real time code for 10 seconds. Take $k_f = 100$ volt/Hz.
- Plot (time and frequency) PM signal using the real time code for 10 seconds. Take $k_p = 100$ radian/Hz.

Take N as the **sum** of the last two digits of your BITS ID.

Python Task 2

The message signal $m(t) = 20U \text{sinc}(20U\pi t)$, where $U \sim (1, 5)$ is a uniform random variable modulates a carrier signal $c(t) = A \cos(2\pi 500t)$. The modulated signal is passed through a channel $h(t) = 0.01\delta(t)$ with AWGN $\sim N(0, 0.001)$. Plot the message signal, carrier signal, modulated signal before channel, modulated signal after the channel with AWGN, and demodulated signal using the envelop detector. Use real-time code for 10 seconds and generate time and frequency domain plots.

Project Task

We have started individual tasks with a bigger picture: to design an end-to-end simulator for a digital communication system. In this task, we have transmitted modulated signal over band-limited channel with additive noise in real time.