# Instructions for coding session: Exercise Session 5

In this coding exercise, you will be smoothing empirical transfer function estimates. For this, you will be divided into Breakout rooms.

Use the given Matlab p-code file to obtain input output data from a system as follows:

[u\_prbs,y\_prbs,u\_rand,y\_rand] = GenerateData();

Similar to the Matlab exercise in Exercise 5, you are now given a PRBS and a random input signal. Additionally, you are given the corresponding output signals. For the tasks defined later, you will be using the provided data. If you are in an **odd numbered** (for example, 1, 3 etc) breakout room, use the PRBS data. If you are in an **even numbered** breakout room (for example, 2, 4 etc), use the random data.

Discuss with your peers in the breakout rooms, and perform the following tasks.

1. Obtain an ETFE of the system, and plot its magnitude between the frequencies [0,2\*pi).
2. Use the given Hann window function WfHann.m and perform smoothing on this ETFE. You can use Lecture slide 6.33 as a reference for this task. Choose different values of the smoothing parameter gamma, and obtain the corresponding smoothed estimates.
3. In the same plot as the original ETFE, plot the smoothed estimates for at least 3 different values of gamma, showing the effect of varying gamma on the ETFE. What do you think is the ideal choice of gamma for your data? Why?
4. *Discuss:* Based on exercise 3, what do you think about the best gamma for the other group, that is, is gamma\_PRBS > gamma\_rand or is it the other way around? Why?

You have 30 minutes to perform the following tasks.