Many (all) the questions have been answered during the Q&A period. Nevertheless, we ask that you provide written answers below so students can come back to read them again. Thanks!

1. (Page 15) Are we considering Yl diagonal?

In this context in the flavor basis definitely not, the Yukawas generically have off diagonal entries that once we change to the mass basis turn into the off-diagonal nature of the CKM matrix.

2. (Page 15) Can we better understand where the mixing is (Yd vs Yu) if we had measurements of the (mass basis) Yukawa couplings of 2 generations? top/bottom+charm/strange?

This is a good question. Since we technically have the freedom to put the mixing into Yu or Yd it's ambiguous as to what measurements fix this. However, if there are BSM contributions that then let us ask questions about new contributions to flavor physics, then this can be differentiated. In particular if one aligns new physics into the up or down sector, the contributions to K-Kbar vs D-Dbar mixing are affected differently. Therefore improving measurements in e.g. the D-Dbar sector are very important.

3. (Page 31) How is that operator (O_T) is related to Electro weak symmetry breaking? instead of parentheses that should be a mod sign?

This operator corresponds to a shift in the T-parameter and effectively is giving a different contribution to the masses of the W and Z boson as compared to the SM prediction. This is why I say it's related to EWSB since if you had a different prediction for the W and Z masses than in the SM then ultimately there would be contributions to EWSB beyond the SM Higgs doublet.

4. (Page 36) Last problem on page36

Flavor vs Flavorful physics is what I think this is referring to. What I mean by Flavor is any BSM physics that explicitly is trying to explain the origin of SM flavor (which is a tall task). Flavorful physics just corresponds to having BSM physics that also could interact with SM flavor non-trivially. For example some new Higgs doublet that treated up quarks differently than the Yukawas of the SM do, or some new DM that only wanted to interact with strange quarks for some reason. These are just examples, but what I mean by this is that it doesn't necessarily explain anything about why OUR Yukawa couplings have the values that they do, but on the other hand it shows new physics can be “flavoful”. This has important consequences for flavor experiments, but also how we would search for new physics at the LHC, future experiments, or other types of experiments. The fact that the scales between flavorful and flavor can be suppressed differently is due to the fact that you aren’t requiring an explanation of everything. The example I rushed though at the end of the lecture, spontaneous flavor violation, is one of these, where it has an auto-alignment mechanism that avoids FCNCs has very interesting phenomenology - but doesn’t try to explain the origin of our Yukawa couplings.