Educational tasks for students

If teaching your students about the FFM you can use these as 'homework' tasks

Task 1:

In excel, using the fitness fatigue formula calculate the performance of an athlete over 100 days (i.e. you should have a performance value in each row representing a day)

$$p(t) = p(0) + k_1 \sum_{s=0}^{t-1} e^{-\frac{(t-s)}{\tau_1}} W(s) - k_2 \sum_{s=0}^{t-1} e^{-\frac{(t-s)}{\tau_2}} W(s)$$

where $p(0)$ is the initial performance level, s (days) goes from 0 to 100.

Assume that the athlete has a daily input of 100 for $W(s)$ for 80 days, and then tapers this by reducing the input by 2 units every day (up to the final day, day 100).

Make your calculations with the following parameters

$p(0) = 500, k_1 = 1, k_2 = 2, \tau_1 = 27, \tau_2 = 10.$

Task 2:

You will see that task 1 is hard to complete in excel in a compact way due to the summing that has to be done. So you may have to include lots of columns to complete your calculation. For task 2 you will complete the above analysis using a more effective recursive method.

$$p(t) = p(0) + k_1 g(t) - k_2 h(t)$$

$$g(t) = g(t-s)e^{-\frac{s}{\tau_1}} + w(t)$$

$$h(t) = h(t-s)e^{-\frac{s}{\tau_2}} + w(t)$$

To start you off on this one.

$$g(1) = g(0)e^{-\frac{0}{\tau_1}} + w(t) = w(t) = 100$$

$$g(2) = g(1)e^{-\frac{1}{\tau_1}} + w(2) = \cdots$$

$$g(3) = g(2)e^{-\frac{1}{\tau_1}} + w(3) = \cdots$$

Note, that $s = 1$ in all of these examples because you are training every day, so the closest training session is always just one day behind.

Task 3 (As part of an R course):

Write a function in R to calculate and plot the performance across days for both methods above by inputting w(t), and all of the parameter values (i.e. by providing a data frame). Course to complete first is: https://www.coursera.org/learn/r-programming