EG3204 Programmable Electronics lab week 9
Design your own digital watch

In this weeks lab you will design your own digital watch. A standard digital watch shows the time in seconds, minutes and hours. The design of a digital watch can be quite simple–using five logic blocks: *clock divider*, *seconds counter*, *minutes counter*, *hours counter* and *7-segment decoder* as shown in Figure . Here the second and minute counters consist of 2 digits 0-5 & 0-9 and the hour counter consists of 2 digits 0-2 & 0-9. A 4-bit MOD counter is used for one digit. In total six MOD-counters are needed:

- 2x MOD-10 counters for LSD seconds and minutes (0..9)
- 2x MOD-6 counters for MSD seconds and minutes (0..5)
- 1x MOD-10 counter for LSD hours (0..9)
- 1x MOD-3 counter for MSD hours (0..2)

The six MOD counters are connected in such a way that overflow flag of a MOD counter acts as an enable input for the next MOD counter. Here the clock divider output acts as an enable input for the LSD seconds counter (the first counter).

The Altera DE0 board has 4 common anode 7-segment display units. To drive these units you need to design a BCD to 7-segment decoder. The BCD decoding has been given in lectures. You will be provided with:

- A clock divider
- A 4-bit MOD counter
- Top level VHDL file for a digital watch without architecturea.

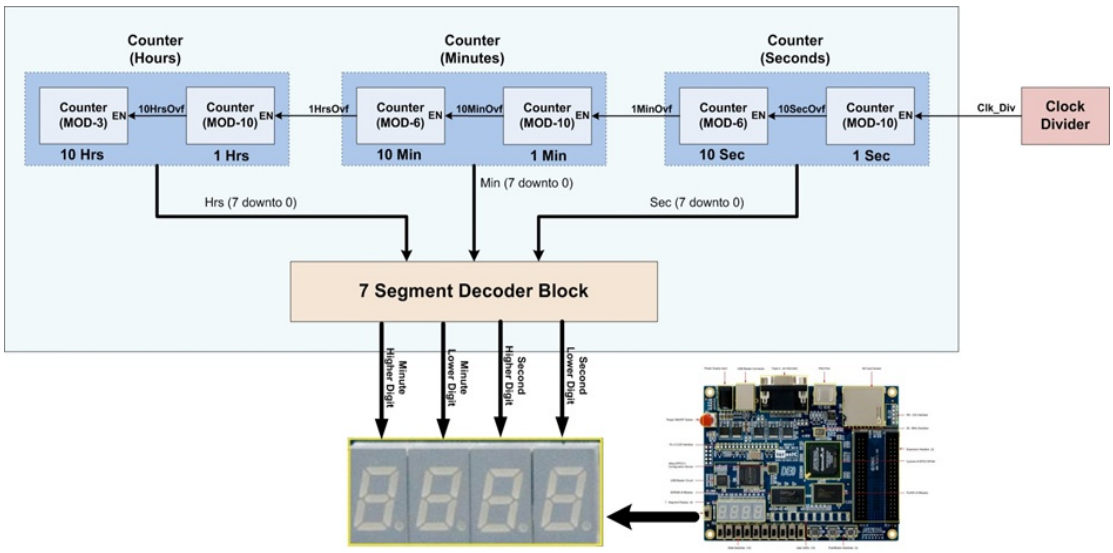

Figure 1: Block diagram of a digital watch.