The multi-cycle processor contains the following components :

1) ALU
2) Register File

The processor maintains a program counter that it uses to retrieve instructions in the proper sequence from memory. Memory is implemented as an array of std_logic_vectors of length 16.

In the mini_comp.vhd file, we instantiate the memory, register file, ALU. This creates the components of the processor and the memory component to store a program and test the processor.

In the behavioral part of the code, we determine how the data should flow, i.e., what states it must go through and what inputs the components must take in each state depending on the operation code(this introduces multiplexers into the processor structure) to execute the given program pointed by the program counter

Coming to how register files and ALU work

Register files has a storage of 8 registers of each 16 but length and its functionality is to take input and store it in the respective register and output a 16bit sequence when asked for particular and naive behavioural code is used for this
And coming to ALU, we have dealt every case separately by taking first 4 and last 2 bits as input all the time and deciding on what to do based on that.