PROJECT CHECKLIST
CHORDINATION

● Filtered-FFT Module:
  ○ Key features:
    ■ Takes the raw signal from the microphone
    ■ Low-pass filter the raw signal to remove noise
    ■ Generate the FFT of the filtered signal
    ■ Detect the pitch and send to the Chord Calculation Module and the Synthesis Module
  ○ Interfacing:
    ■ Interfacing with a microphone
  ○ Testing:
    ■ Take in signals with pure locked-on pitches and check if the assigned pitches are correct.
    ■ Take in signals with noise/overtone and clear locked-on pitches and check if the assigned pitches are correct.

● Chord Calculator Module:
  ○ Key features:
    ■ Calculate matching note from filtered pitch given by the FFT module
    ■ Move from one existing chord to another chord while adhering to the rules of Music Theory.
    ■ Bring chord history into account in order to give preference to chords that form cadences and other structures.
  ○ Interfacing:
    ■ Takes in locked-in pitch from the FFT module
    ■ Takes in tempo from the tempo module
    ■ Takes in key from switches
    ■ Outputs possible chords in order of preference to the voicing module
  ○ Extension:
    ■ Allow for explicitly minor chord progressions
  ○ Testing:
    ■ Take in a locked-on pitch and check if the assigned note is correct.
    ■ Check whether outputted chords are valid and state machine progression between notes works properly

● Tempo Module:
  ○ Key Features:
    ■ Takes user input about how regular interval indicating how often chords should change
    ■ Uses switches to select pre-defined values
  ○ Interfacing:
    ■ Takes in switch values (or other input -- see possibility in Extension)
- **Extension:**
  - Allow users to clap in or sing in a beat indicating the tempo.
- **Testing:**
  - For extension: extensive testing needed to make sure clapping inputted tempo is actually the inputted tempo.
  - Otherwise: check whether the chord change actually occurs on tempo or changes at an incorrect beat.

- **Voicing Module**
  - **Key features**
    - Checks for all possible note combinations (including tripling the root, etc)
    - Voicing validity check module checks for:
      - Voice overlap
      - Voice crossing
      - Invalid interval jumps
      - Parallel unisons, fifths, octaves
      - Hidden parallels in the outer voices
      - Resolving the seventh down
      - Resolving the leading tone to the tonic
    - Selects most highly ranked valid chord voicing
  - **Interfacing**
    - Takes an input bus of 64 bits, which consists of four chords with four notes each. Each note takes up 4 bits.
    - Outputs 21 bits that consist of the 3 pitches that the module has voiced, each consisting of 7 bits.
  - **Testing**
    - Check different voicings and individually check whether the module invalidates all possible voicing mistakes
    - Check required for the notes being placed in the right octave
    - Auditory check to catch any other subtle mistakes that make voicing sound unnatural.

- **Synthesis Module**
  - **Key features**
    - Take pitch input from the Filtered-FFT Module, the Voicing Module
    - Voice the pitches and send output to speaker
    - Be able to record the output
    - Be able to playback the recording
  - **Interfacing:**
    - User can choose record or not by turning on or off a switch
    - User can choose to play back by turning on or off a switch
    - Interfacing with a speaker
  - **Extension:**
    - The user will be able to take away the recording with a SD card
○ Testing:
  - Take in 1 original pitch and 3 target pitches and check if the output is correctly voiced.
  - Take in a sequence of original pitches and 3 target pitches and check if the output is correctly voiced.
  - Take in a sequence of original pitches and a sequence of 3 target pitches and check if the output is correctly voiced.