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 swich
        - 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 if correctly voiced.