List of Mini Projects to be Submitted as Take Home Examinations

1. **Pitch Estimation Algorithm:**

   Implement a pitch estimation algorithm (e.g., YIN algorithm) in a programming language of choice. Evaluate and compare the performance of different pitch estimation algorithms.

2. **Song Genre Visualisation and Classification:**

   Create a program to analyze and visualize the characteristics of different music genres. Use audio features such as tempo, spectral centroid, and rhythm to classify songs into genres. Develop a tool to visualize audio signals in the time and frequency domains. Explore different visualization techniques like spectrograms, waveforms, and pitch contours.

3. **Reverberation Modeling using Odeon:**

   Utilize the Odeon software (demo version) to model the reverberation characteristics of a virtual room. Analyze the impact of room geometry and materials on reverberation time (T60). Model the acoustic behavior of various room shapes and sizes. Analyze the effects of different materials on sound reflection and absorption.

4. **Acoustic Scene Analysis:**

   Implement a system for acoustic scene analysis in a building. Measure and analyze parameters such as reverberation time, early reflections, and sound decay.

5. **(Real-time) Pitch Shifting:**

   Develop a (real-time) pitch shifting algorithm using signal processing techniques. Experiment with different pitch shifting methods and analyze their impact on audio quality.

6. **Audio Equalization Design:**

   Design and implement a digital audio equalizer with adjustable frequency bands. Experiment with different filter types and analyze the impact on the audio signal.

7. **Frequency Response Analysis:**

   Develop a tool to measure and analyze the frequency response of audio equipment (e.g., speakers, microphones). Explore techniques to compensate for irregular frequency responses.

8. **Impulse Response Measurement:**

   Develop a system to measure the impulse response of a room using a loudspeaker and microphone. Use the measured impulse response for room acoustics analysis.