PHY1106: Waves and Oscillators	Dr. Pete Vukusic

Lecture 21.

Lecture objectives.

- To appreciate the motion of masses at special points on dispersion curve.
- To appreciate the significance of the first Brillouin zone: i.e. that all possible modes of vibration are described; and that modes outside the first Brillouin zone turn out to be equivalent to ones inside (but contain redundant information).
- To follow a case example for modes of vibration for a finite periodic structure.
- To derive the wave equation for another type of wave: i.e. longitudinal (sound) waves in a solid bar and to derive expressions for its phase velocity.

Post-lecture tasks.

- The characteristic impedance of a certain string is $z = T/v$ where v is the phase velocity. Calculate the linear density of another string which is attached to the first, if it is known that the reflection coefficient R of the wave amplitude at the junction is 0.5.
- A wave on a string given by $\boldsymbol{y = (0.1m)\ \sin[(10s^{-1})\ t + (10m^{-1})\ x]}$ is superimposed on another wave, $\boldsymbol{y = (0.1m)\ \sin[(10s^{-1})\ t - (10m^{-1})\ x]}$, where m and s indicate the units of the numerical quantities. Find the separation between the nodes of the resulting standing wave. What is the average flow rate of energy for this standing wave?