PHY1106:Waves and Oscillations	Dr. Pete Vukusic

Lecture 7.

Lecture objectives.

- To understand the graphical form of the displacement relationship to driving frequency and the velocity relationship to driving frequency; particularly at low, high and at the resonant frequency.
- To be familiar with the phase relationship between displacement and driving force.
- To be able to derive the relation for average power of a forced oscillator.

Post-lecture tasks.

1. For a mass of 2.5kg on a spring of k=100N/m, which experiences a retarding force of damping coefficient b kg/s, calculate the largest value of b for which the motion will be oscillatory.

2. At what frequency and angular frequency will this oscillation be measured?

3. At what angular frequency will the phase angle ϕ be $\pi/4$ for this system.

4. A force of the form $F=5.\exp(j\omega t)$ is then applied to the system. Calculate the average power developed when the driving force is exactly $\pi/2$ out of phase with the displacement.

5. Write down the relation for the displacement of a forced damped oscillator. Differentiate this to find the expression for the velocity of the oscillator. Sketch the graphical form of this velocity against frequency. At what driving frequency will the oscillator reach maximum velocity (i.e. achieve velocity resonance)?