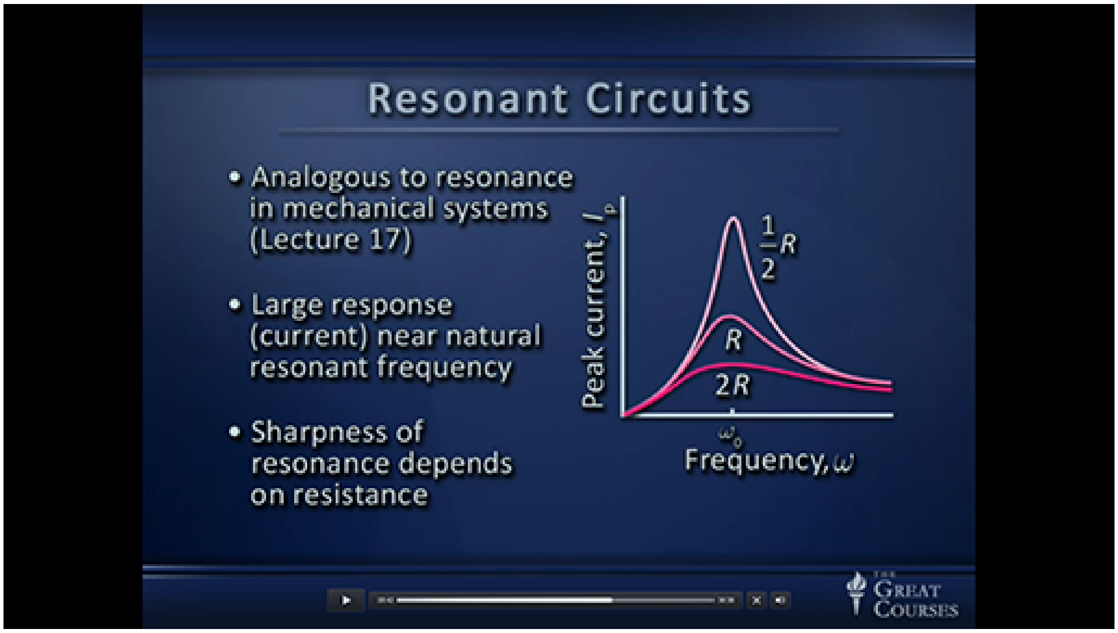
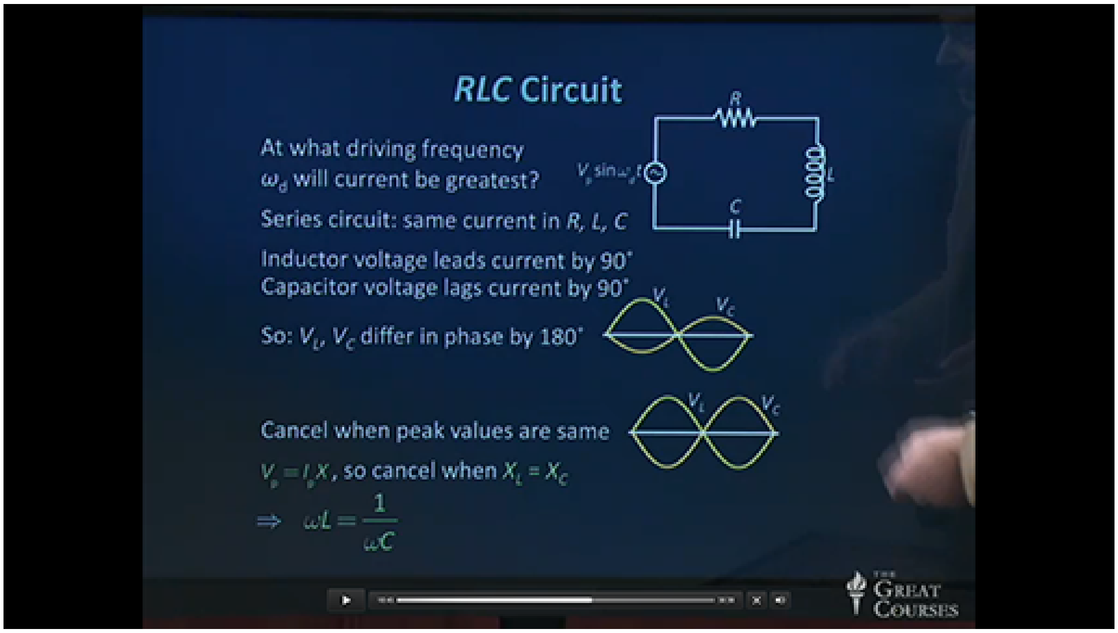
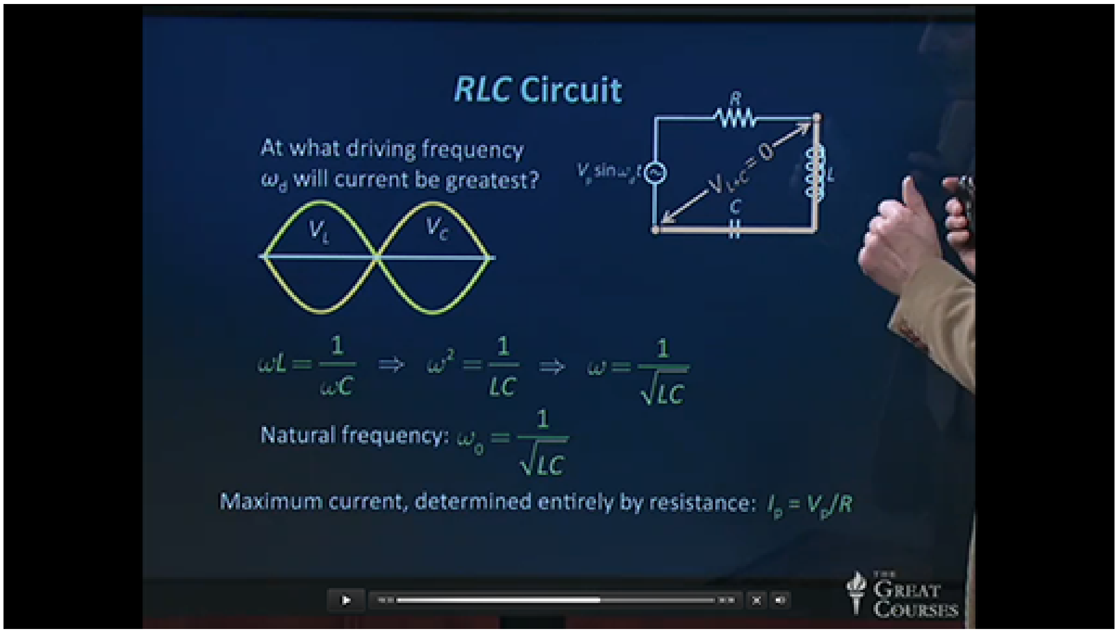
Resonance

FROM Physics Course (Great Courses) - Lecture 39

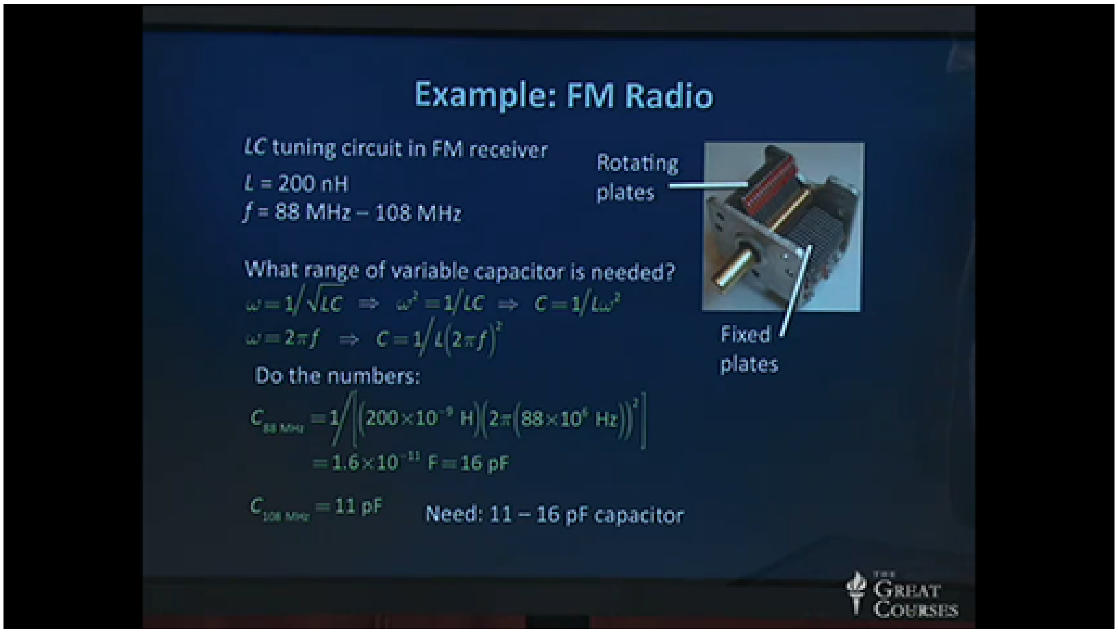
The resonant frequency is that frequency in which current is the greatest, with the shape and magnitude of the curve dependent on the relationship between capacitance and inductance, with the sharp-ness of the resonance dependent on the resistance of the circuit.

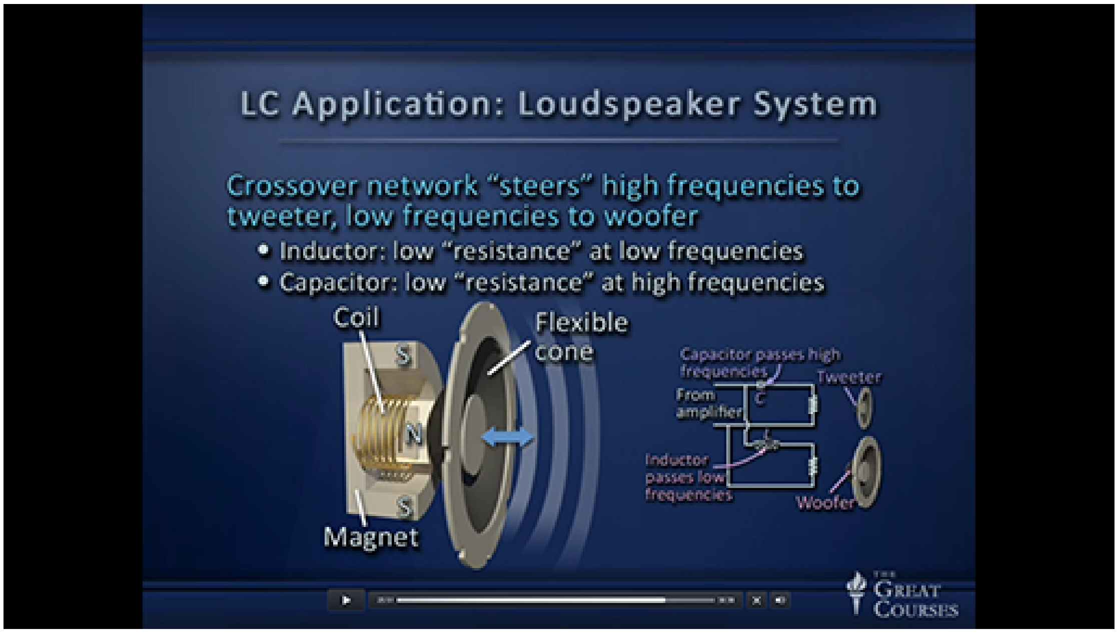






One application is in tuning radio frequencies. It is the relationship between Capacitance (C), Inductance (L), and frequency (f) to determine the resonant frequency.




LC Application: Loudspeaker System
Crossover network "steers" high frequencies to tweeter, low frequencies to woofer
• Inductor: low "resistance" at low frequencies
• Capacitor: low "resistance" at high frequencies
Coil
Flexible cone
Magnet
S
N
S
Capacitor passes high frequencies
Tweeter
From amplifier
C
Inductor passes low frequencies
Woofer
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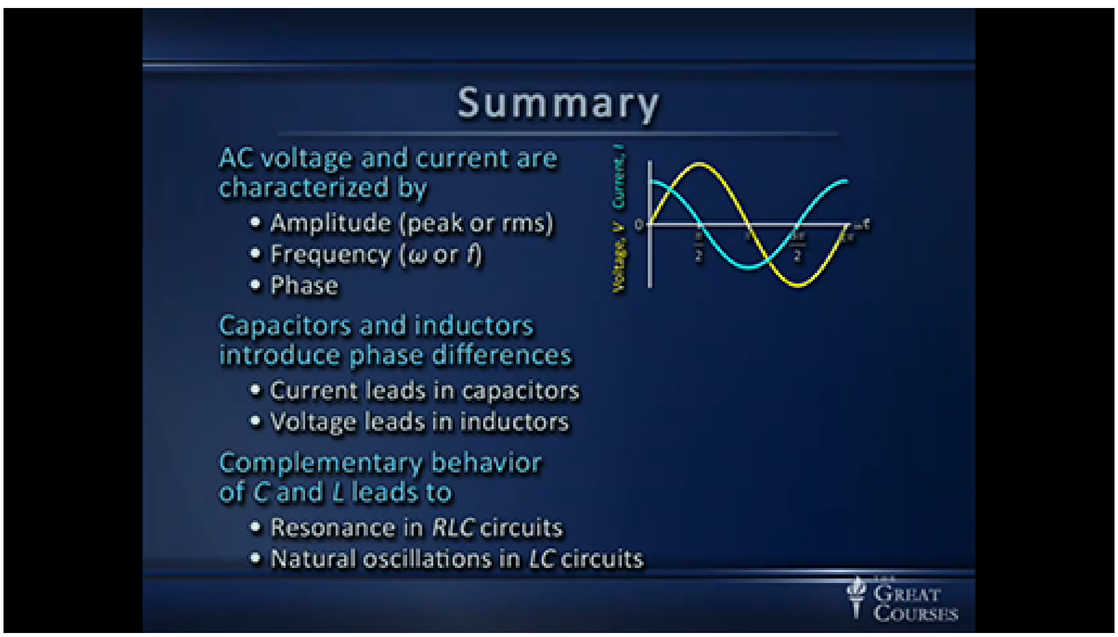
Summary
AC voltage and current are characterized by
• Amplitude (peak or rms)
• Frequency (ω or f)
• Phase
Capacitors and inductors introduce phase differences
• Current leads in capacitors
• Voltage leads in inductors
Complementary behavior of C and L leads to
• Resonance in RLC circuits
• Natural oscillations in LC circuits
Voltage, V
Current, I
0
ωt
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