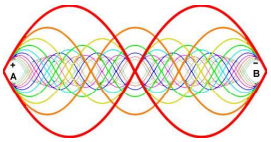
SIERRA COLLEGE

MECH 10
Fundamentals of Electronics

Mechatronics
Real Skills Real Jobs

Class 16
Reactive Components V
Resonance



1

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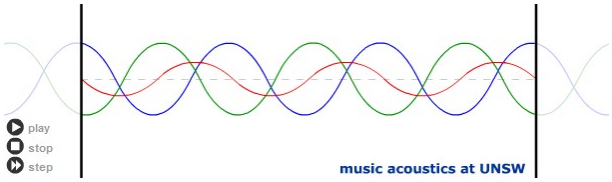
MECH 10
Fundamentals of Electronics

Mechatronics
Real Skills Real Jobs

- Resonance
  - The tendency of a system to increase the amplitude of oscillation for certain frequencies



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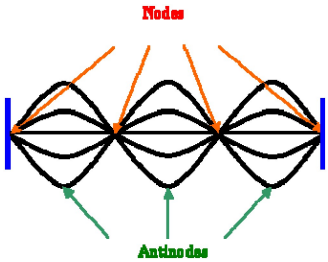
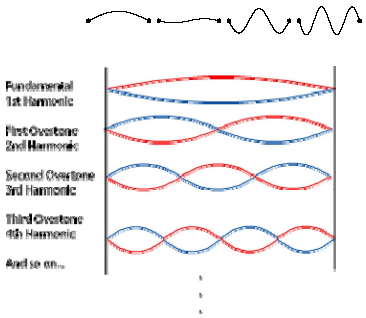
MECH 10
Fundamentals of Electronics

Mechatronics
Real Skills Real Jobs

- Resonance
  - The tendency of a system to increase the amplitude of oscillation for certain frequencies





3

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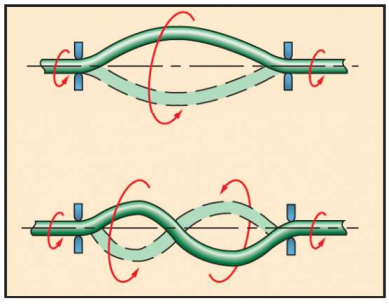
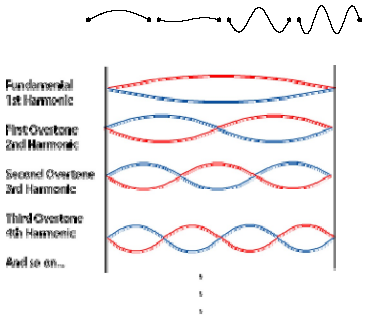
MECH 10
Fundamentals of Electronics

Mechatronics
Real Skills Real Jobs

- Resonance
  - The tendency of a system to increase the amplitude of oscillation for certain frequencies





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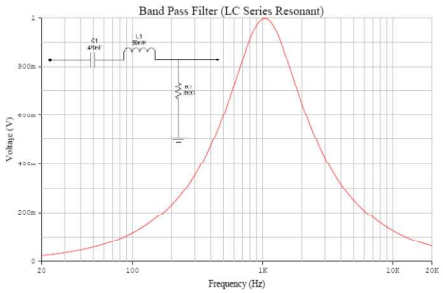
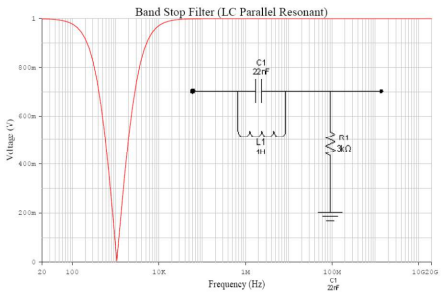
MECH 10
Fundamentals of Electronics

Mechatronics
Real Skills Real Jobs

- Electrical Resonance
  - The tendency of a circuit to increase the amplitude of oscillation for certain frequencies
    - Electrical nodes & anti-nodes





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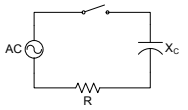
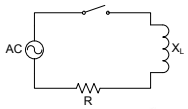
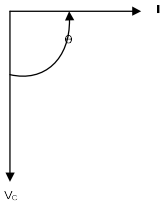
MECH 10
Fundamentals of Electronics

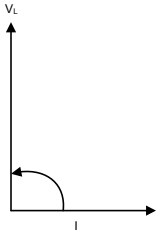
Mechatronics
Real Skills Real Jobs

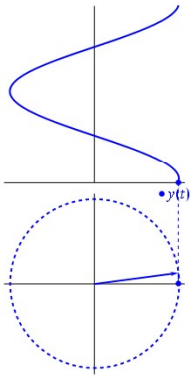
- Electrical Resonance
  - Series RL & RC Phasor Diagrams
    - Constant current reference
    - Variable voltage & impedance











I leads V_C

V_L leads I

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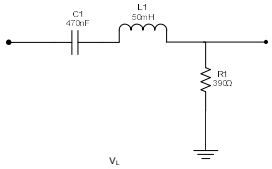
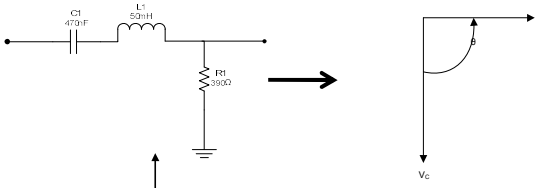
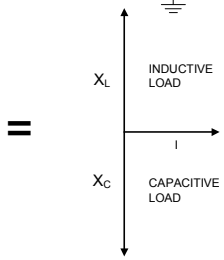
MECH 10
Fundamentals of Electronics

Mechatronics
Real Skills Real Jobs

- Electrical Resonance
  - Series RLC Phasor Diagrams

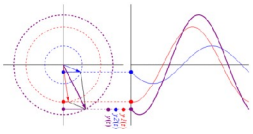






X_L & X_C cancel at $f_{resonance}$

Voltage drop at output resistor only!



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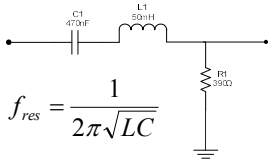
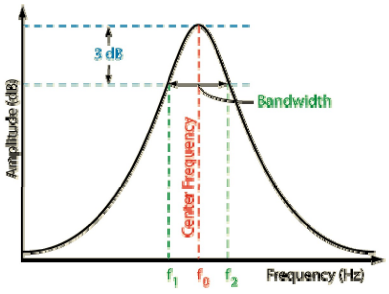
MECH 10
Fundamentals of Electronics

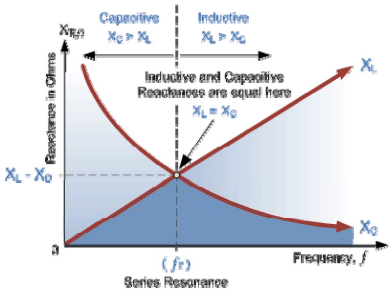
Mechatronics
Real Skills Real Jobs

- Electrical Resonance
  - Series RLC Band Pass Filter



$$f_{res} = \frac{1}{2\pi\sqrt{LC}}$$





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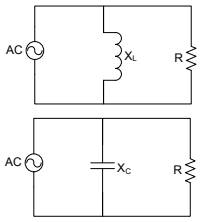
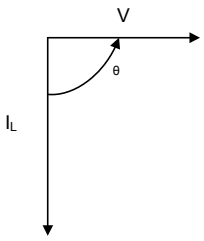
MECH 10
Fundamentals of Electronics

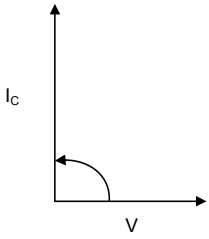
Mechatronics
Real Skills Real Jobs

- Electrical Resonance
  - Parallel RL & RC Phasor Diagrams
    - Constant voltage reference
    - Variable current through branches

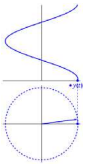




I_L lags V



I_C leads V



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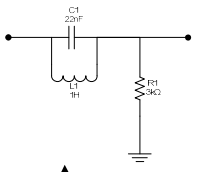
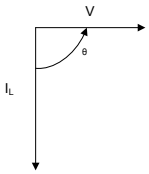
MECH 10
Fundamentals of Electronics

Mechatronics
Real Skills Real Jobs

- Electrical Resonance
  - Parallel RLC Phasor Diagrams





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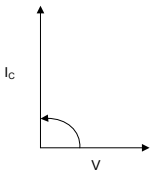

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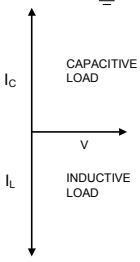
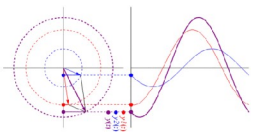


I_L & I_C cancel at $f_{resonance}$

Voltage drop at tank circuit only!



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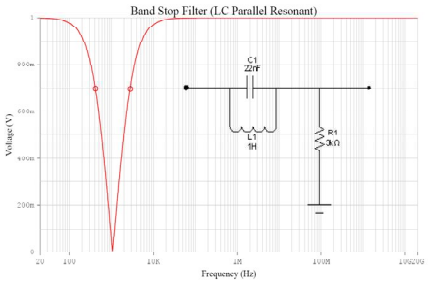
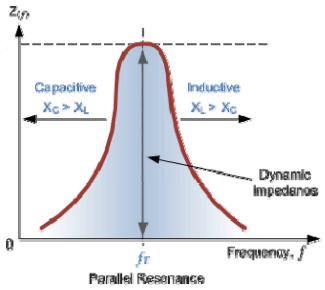
MECH 10
Fundamentals of Electronics

Mechatronics
Real Skills Real Jobs

- Electrical Resonance
  - Parallel RLC Band Stop Filter

$$f_{res} = \frac{1}{2\pi\sqrt{LC}}$$





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MECH 10
Fundamentals of Electronics

Mechatronics
Real Skills Real Jobs

- Lab 16 – Resonance

Learning Objectives

- Simulate and test circuits using circuit analysis software
- Create Bode plots of RLC frequency performance
- Analyze band pass filter performance
  - Cutoff frequency
  - Bandwidth

		Points Possible
Documentation	Quality of documentation (neatness, clarity, spelling, grammar), Expected and measured values recorded on schematic diagram	**10**
Band Stop Filter	Bode plot reviewed & signed, bandwidth, X_L, X_C, f_{CO}, calculated and recorded in data table	**10**
Band Pass Filter	Bode plot reviewed & signed, bandwidth, X_L, X_C, f_{CO}, calculated and recorded in data table	**10**
Conclusions	Questions answered completely & accurately.	**20**
	Total	**45**

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