Demonstration 72.69 – Large component LRC circuit

$$\omega_{resonant} = \frac{1}{\sqrt{LC}}$$

For the values in this circuit, $\omega_{resonant}$ is about 395 rad/s, or, dividing by 2π, 63 Hz. Line frequency is 60 Hz (377 rad/s). Inserting the iron rod into the inductor raises its effective inductance and thus lowers $\omega_{resonant}$ by enough to bring the circuit into resonance. (L needs to be about 0.18 H, or about 12% higher than without the rod.) Inserting the rod further lowers the resonant frequency even more and takes the circuit back out of resonance.