

**PHYSICS 211L**  
**ELECTRICITY AND MAGNETISM LABORATORY**  
**(0.2; 1 credit)**

**Textbook:** *Physics for Scientists and Engineers* (Volume 2)

**Laboratory Manual & Reports:** Downloaded from Moodle

**Laboratory Sessions**

1. Error Analysis: Significant figures, estimation of errors, analysis of results.
2. Ohm's Law: Study of the current-voltage relationship for both ohmic and non-ohmic devices. Determination of the resistivity of different-material rods.
3. Basic Oscilloscope Operations: Amplitude and frequency measurements, waveform studies, calculating phase difference with Lissajous figures.
4. Electric Circuits: Using a wheat-stone bridge circuit to measure resistances of a coil and a set of resistors. Study of the maximum power delivered by a voltage source.
5. Capacitance and Dielectric Constants: Series and parallel combinations of capacitors and BNC cables. Parallel plate capacitor, dielectric constant measurement.
6. RL and RC Circuits: Study of the transient behavior of voltages and currents in RC and RL circuits.
7.  $e/m$  Ratio of Electrons: Determination of the charge to mass ratio of an electron. The setup consists of an evacuated cathode ray tube at the center of Helmholtz coils.
8. Magnetic Induction Fields: Magnetic induction fields of a bar magnet, a solenoid and a coil are measured by using a Hall-effect Teslameter.
9. RLC Series Circuit: Studying resonance in an RLC series circuit. Using an oscilloscope for measurement.
10. Transformers: Studying step up/down transformers and studying the effect of coils configuration and iron core on the transfer of magnetic flux from the primary to the secondary coil of a transformer.
11. Current Balance: Use of a current balance to measure the magnetic force between two straight parallel conducting wires and thus determining the permeability of free space.