Physics II Lab (1240L&1320L) **Syllabus** UNM-VC **Spring 2024** Tuesdays, noon-2:45p
1 credit hour; expect to spend 2 or more hours performing the lab, analyzing data, writing a lab report.

Instructor: Clifton Murray wcmurray@unm.edu, 505-925-8727
Available Office times M W 1:30-3:15p, TTh 4:15-5:15p, also Th 11:45a-12:15p
Pre- or Co-requisite: Physics II "Lecture" (Physics 1240 or 1320)

Course Purpose & Description: Physics II Lab consists primarily of hands-on experiments designed to give the student (1) a more intuitive grasp of topics discussed in lecture, (2) the opportunity to test physics principles for themselves by measurement (or in some cases, by direct observation or experience), (3) the ability to correctly use electrical measuring instruments, and (4) increased skill at propagating measured values and units through mathematical calculations.

Lab Topics and Student Learning Objectives (SLO's): By semester's end, the student with a B or higher grade should be able to demonstrate that she/he can perform all of the boldfaced items below, plus selected others from the list, depending on equipment availability &/or instructor or student inspiration. The lab topics are listed in the approximate order in which they will occur.

1) Illustrate the law of charges, using simple electrostatic apparatus.
2) Explain why a charged object can attract an uncharged object, in terms of Coulomb's law, and illustrate the phenomenon with a simple electrostatic experiment.
3) Use a multimeter, in ohmmeter, voltmeter, or ammeter mode as appropriate, for measuring resistance, voltage, and current.
4) Explain, and convert as needed for calculations, the units for resistance, voltage, and current.
5) Construct a simple d.c. circuit given the necessary components.
6) Correctly measure R, V, and I in an actual simple circuit.
7) Given two of the three quantities in a d.c. circuit, predict the 3rd quantity to within a reasonable uncertainty, i.e, be able to analyze the circuit using V = I R
8) Construct a resistors-in-series circuit, predict the resistance, voltage, and current anywhere in the circuit, and confirm the predictions by appropriate measurement.
9) Construct a resistors-in-parallel circuit, predict the resistance, voltage, and current anywhere in the circuit, and confirm the predictions by appropriate measurement.
10) Define Capacitance both qualitatively and quantitatively.
11) Calculate the capacitance of an actual parallel-plate capacitor from it's physical dimensions, apply a voltage across it, then compute the charge on each plate using C = Q / V.
12) Predict the time constant of a charging and/or discharging RC circuit, then test the prediction experimentally by measurement.
13) Explain the Law of Poles in magnetism.
14) Illustrate the effect of a magnetic field on moving charge, by using it to deflect an electron beam..
15) Illustrate how moving charge—i.e., current—can be induced by moving a conductor through a magnetic field.
16) Illustrate how changing the magnetic flux through a loop conductor can induce an emf, and hence a current around the conductor.
17) Demonstrate an understanding of the basic controls on an oscilloscope, by acquiring a stable pattern on its display of an alternating voltage.
18) Set up and obtain a desired a.c. voltage from a signal generator, display the signal, and analyze the display for peak voltages, rms voltages, and frequency.
19) Explain that electric meters applied to a.c. measure rms voltage and current.
20) Modern Physics: Determine the charge to mass ratio of the electron, experimentally.
21) Modern Physics: Determine Planck's constant experimentally.
22) Assuming 3.0 X 10^6 V/m as the breakdown field, determine the voltage produced for maximum spark by a Van de Graaf generator.

The instructor reserves the right to create new laboratory exercises based upon equipment availability and/or inspiration, which may supplant non-boldface items in that list. Any such new labs will parallel and/or complement topics studied in lecture.

Some labs will require a lab report; in that case, there may be time available during the lab periods to write them.

Academic dishonesty, including copying another student's lab, will be cause for a lowered grade or being dropped from the course.

Disruptive or unruly behavior such as ridiculing another student or the instructor, or intentional rough handling of/damage to lab equipment, will result in being expelled from the class.

**No text messaging or cell phone calls* in classroom. However, phones may be used as a tool during some labs*

Title IX Our classroom and our university should always be spaces of mutual respect, kindness, and support, without fear of discrimination, harassment, or violence. Should you ever need assistance or have concerns about incidents that violate this principle, please access the resources available to you on campus. Please note that, because UNM faculty, TAs, and GAs are considered "responsible employees" by the Department of Education, any disclosure of gender discrimination (including sexual harassment, sexual misconduct, and sexual violence) made to a faculty member, TA, or GA must be reported by that faculty member, TA, or GA to the university's Title IX coordinator. For more information on the campus policy regarding sexual misconduct, please see: https://policy.unm.edu/university-policies/2000/2740.html.

Accommodations: UNM is committed to providing equitable access to learning opportunities for students with documented disabilities. As your instructor, it is my objective to facilitate an inclusive classroom setting, in which students have full access and opportunity to participate. To engage in a confidential conversation about the process for requesting reasonable accommodations for this class and/or program, please contact me privately during office hours or at wcmurray@unm.edu, or you may contact UNM-Valencia Equal Access Services (Sarah Clawson, Coordinator), at (505) 925-8840, email sjclawson@unm.edu.

COVID-19 Health and Awareness. UNM is a mask friendly, but not a mask required, community. If you are experiencing COVID-19 symptoms, please do not come to class. If you do need to stay home, please communicate with me at wcmurray@unm.edu ; I can work with you to provide alternatives for course participation and completion. Let me, an advisor, or another UNM staff member know that you need support so that we can connect you to the right resources. Please be aware that UNM will publish information on websites and email about any changes to our public health status and community response.

Default policy is **no makeup labs**. If unavoidable circumstances force you to miss a lab, notify and explain to the instructor ASAP—depending on circumstances, a makeup might be doable at semester's end. Otherwise, note that if a lab is missed, the score for that lab is zero and the student cannot receive an A+. However, the lowest score will be dropped at semester's end, so if circumstances force you to miss one lab, that zero will be the one (and only) score dropped, so you can still receive as high as an A for the course.

Grading: Each lab will be accompanied by a worksheet, which will outline theory and procedures, and which will contain space for showing measurements, reasoning, calculations, and answering questions. The worksheet will be turned in after the lab class for scoring.

Grades for labs, lab reports, and the overall course will be determined according to the following scheme:

$97.5 \leq x < 100\%$	A+	(*unless a lab is missed*.)
$92.5 \leq x < 97.5$	A	
$90 \leq x < 92.5$	A-	
$87.5 \leq x < 90$	B+	
$82.5 \leq x < 87.5$	B	
$80 \leq x < 82.5$	B-	
$77.5 \leq x < 80$	C+	
$72.5 \leq x < 77.5$	C	
$70 \leq x < 72.5$	C-	*note that a C- might not meet the prerequisites for some courses or programs
$60 \leq x < 70$	D	
Below 60%	F	

No Incomplete (I) grades will be given.