SYLLABUS FOR PHYS 413-1001 (FALL 2021)

Professor: Dr. Joshua Island Course: Intermediate Lab I Office: BPB 167 Lecture Section: 1002 Office phone number: 895-3847 Classroom: BPB 265 Email: joshua.island@unlv.edu Lectures: M,T, 2:30 pm – 5:15 pm Office hours: Wed, anytime

Textbooks: *Experiments in Modern Physics* by Melissinos and Napolitano. *Data Analysis for Physical Science Students* by Lyons.

Supplementary texts:

The Art of Experimental Physics by Preston and Dietz. A Student's Guide to Data and Error Analysis by Berendsen. Data Reduction and Error Analysis for the Physical Sciences by Bevington.

Course Overview:

Thisis an upper division modern physics course that emphasizesthe execution and report of laboratory experiments. As well as demonstrating key experiments in the development of modern physics, this laboratory introducesstudentsto critical techniques and methodsin experimental physics. Students are required to complete **six experiments** throughout the course. The required and supplementary textbooks provide detailed guidelines for some of the experiments, noted in the experiment descriptions below in Table 1. In this course, students are expected to set up their own apparatus, maintain an orderly lab notebook, and report their results in a clear and concise manner. Assessment is primarily based on written reports which are required for each experiment. The laboratory notebook and laboratory performance will also be assessed.

Learning Outcomes:

The students will complete the course with the ability to execute, analyze and report physics experiments.

Laboratory notebooks format and content:

The lab notebook should be kept up-to-date and have numbered pages, dated entries, sketches of the apparatus, and a description of procedures. The lab notebook should also contain the recorded data and any analysis, including error.

Lab report format and content:

The lab reports will be written in **LaTeX** using a standard class template (see attached template developed from the American Institute of Physics manual style). The template code will be provided to all the students. The report should include a title, name, abstract, introduction, theoretical background, methods/results/analysis, interpretation/conclusions, and numbered references. The text should be **clear and concise** and error analysis is required to interpret the results. Figures and tables should be numbered and have an appropriate caption.

page 1 **Overall assessment** Six experiments, each with an accompanying lab report = 60% Lab notebook = 20% <u>Personal observation = 20%</u> Total Possible 100%

Individual assessment breakdown:

Lab reports:

- 1. Physics content 60%: Correctness, strength of logic, completeness, uncertainty, and discrepancies.
- 2. Grammar and composition 30%: Level of prose style, math as prose, organization, spelling, and general grammar.
- 3. LaTeX and general formatting 10%: Proper LaTeX formatting and properly sectioned information with headings.

Lab notebooks: Format and organization 10%, completeness and timely upkeep 10%. Observation: This includes questions and general discussion during the lab period that will test whether the student has read the introductory material (and additional resources if needed) and has a grasp of the concepts and goals of the experiment.

Experiment	Торіс	Melissinos and Napolitano	Preston and Dietz	
Everyone completes experiments 1 & 2				
1	Poisson statistics of background radiation	9.4.2, 10	Pg. 132	
2	Hydrogen atom spectrum, sodium fine structure	1.4-1.6		
Choose three of the following experiments in any order				
3	The Millikan oil drop experiment	1.2		
4	Franck-Hertz experiment	1.3	11	
5	The photoelectric effect		9	
6	Thermionic emission		7	
7	The Hall effect	2.3	17	

Table 1: Experiments in this course. Experiments 1, 2, and 13 must be completed by allstudents.

8	Electron charge to mass ratio		7	
9	Blackbody radiation and Planck's constant		8	
10	A semiconductor junction diode	2.4		
11	The speed of light			
12	Chaos	3.7		
Everyone completes the final experiment				
13	The operational amplifier	3.5		

page 2 Brief descriptions of the first two experiments:

1. Poisson statistics of background radiation.

Objectives: Introduction to statistical distributions. Estimation and interpretation of random errors.

- set plateau voltage on Geiger counter.

- record number of counts per interval, in sets of 0.1, 1 and 10 minute intervals. - also record counts in a set of 0.1 min intervals with the detector in the lead

"castle". - graph the count-per-interval distributions.

- compute statistical measures: mean and standard deviation.
- compute the Poisson distribution corresponding to each data set.

- compare with the Gaussian distribution which approximates the Poisson distribution. - do the measurements follow the Poisson distribution? (use chi squared test) - for each set of measurements, what is the best estimate of the background count rate? - did the count rate vary significantly during the measurements?

2. Hydrogen atom spectrum and sodium fine structure.

Objectives: Introduction to optical spectroscopy. Precision measurements, data analysis and least squares fitting.

- align and focus grating spectrometer.
- calibrate spectrometer with mercury spectral lines; use least-squares fit.

- measure hydrogen atom spectral line positions and determine wavelengths. - determine Rydberg constant.

- measure fine structure intervals in the sodium atom spectrum.

- does each measurement give the same ${}^{2}P_{1/2} - {}^{2}P_{3/2}$ energy difference?

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Official UNLV Announcements and Policies

Syllabus Policies

Please see the Student Syllabus Policies Handout for select, useful information for students. This document can be found at: https://www.unlv.edu/sites/default/files/page_files/27/SyllabiContent MinimumCriteria-2019-2020.pdf

Course Email Statement

You are expected to check your Rebelmail account (ending in @unlv.nevada.edu) daily for this course to see if there are any emails from your instructor. This will be the instructor's official way of contacting you and for making announcements (including any corrections or changes). Please do not contact the instructor by any other email system, or your email may be lost in the anti-spam filter.

Withdrawal from Course

If you withdraw/drop the course after the first week of class, a grade of W will be entered on your transcript for it.

Academic Misconduct

Academic integrity is a legitimate concern for every member of the Campus community; we all share in upholding the fundamental values of honesty, trust, respect, fairness, responsibility, and professionalism. By choosing to join the UNLV community, students accept the expectations of the Student Academic Misconduct Policy, and are encouraged to always take the ethical path whenever faced with choices. Students enrolling at UNLV assume the obligation to conduct

themselves in a manner compatible with UNLV's educational mission. An example of academic misconduct is plagiarism. Plagiarism is using the words or ideas of another person, from the Internet or any other source without proper citation of the sources. See the <u>Student Conduct</u> <u>Code</u>, https://www.unlv.edu/studentconduct/student-conduct.

Auditing Classes

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Classroom Conduct

Students have a responsibility to conduct themselves in class and in the libraries in ways that do not interfere with the rights of other students to learn or of instructors to teach. Use of electronic devices such as pagers, cellular phones, or recording devices, or potentially disruptive devices or activities, are only permitted with the prior explicit consent of the instructor. The instructor may rescind permission at any time during the class. If a student does not comply with established requirements or obstructs the functioning of the class, the instructor may initiate an administrative drop of the student from the course.

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Copyright

The University requires all members of the University Community to familiarize themselves with, and to follow copyright and fair use requirements. You are individually and solely responsible for violations of copyright and fair use laws. The University will neither protect nor defend you, nor assume any responsibility for employee or student violations of fair use laws. Violations of copyright laws could subject you to federal and state civil penalties and criminal liability, as well as disciplinary action under University policies. Additional <u>copyright policy information</u> is available at http://www.unlv.edu/provost/copyright.

Disability Resource Center (DRC)

The <u>UNLV Disability Resource Center</u> (SSC-A, Room 143, https://www.unlv.edu/drc, 702-895-0866) provides resources for students with disabilities. Students who believe that they may need academic accommodations due to injury, disability, or due to pregnancy should contact the DRC as early as possible in the academic term. A Disabilities Specialist will discuss what options may be available to you. If you are registered with the UNLV Disability Resource Center, bring your Academic Accommodation Plan from the DRC to the instructor during office hours, so that you may work together to develop strategies for implementing the accommodations to meet both your needs and the requirements of the course. Any information you provide is private and will be treated as such. To maintain the confidentiality of your request, please do not approach the instructor in front of others to discuss your accommodation needs.

Final Examinations

The University requires that final exams given at the end of a course occur on the date and at the

time specified in the Final Exam schedule. The general schedule is typically available at the start of the semester, and the classroom locations are available approximately one month before the end of the semester. See the <u>Final Exam Schedule</u>, https://www.unlv.edu/registrar/calendars.

Identity Verification in Online Courses

All UNLV students must use their Campus-issued ACE ID and password to log in to WebCampus.

UNLV students enrolled in online or hybrid courses are expected to read and adhere to the <u>Student Academic Misconduct Policy</u>, https://www.unlv.edu/studentconduct/misconduct/policy, which defines, "acting or attempting to act as a substitute for another, or using or attempting to use a substitute, in any academic evaluation or assignment" as a form of academic misconduct. Intentionally sharing ACE login credentials with another person may be considered an attempt to use a substitute and could result in investigation and sanctions, as outlined in the Student Academic Misconduct Policy.

UNLV students enrolled in online courses are also expected to read and adhere to the <u>Acceptable</u> <u>Use of Computing and Information Technology Resources Policy</u>,

https://www.it.unlv.edu/policies/acceptable-use-computing-and-information-technology resources-policy, which prohibits sharing university accounts with other persons without authorization.

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To the greatest extent possible, all graded assignments and assessments in UNLV online courses should be hosted in WebCampus or another UNLV-managed platform that requires ACE login credentials for access.

Incomplete Grades

The grade of "I" (Incomplete) may be granted when a student has satisfactorily completed three fourths of course work for that semester/session, but cannot complete the last part of the course for reason(s) beyond the student's control and acceptable to the instructor, and the instructor believes that the student can finish the course without repeating it. For undergraduate courses, the incomplete work must be made up before the end of the following regular semester. Graduate students receiving "T" grades in 500-, 600-, or 700-level courses have up to one calendar year to complete the work, at the discretion of the instructor. If course requirements are not completed within the period indicated, a grade of "F" will be recorded, and the student's GPA will be adjusted accordingly. Students who are fulfilling an Incomplete grade do not register for the course, but make individual arrangements with the instructor who assigned the "I" grade.

Library Resources

Librarians are available to consult with students on research needs, including developing research topics, finding information, and evaluating sources. To make an appointment with a subject expert for this class, please visit the <u>Libraries' Research Consultation</u> website: <u>http://guides.library.unlv.edu/appointments/librarian.</u> You can also <u>ask the library staff</u> questions

via chat and text message at: http://ask.library.unlv.edu/.

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In accordance with the policy approved by the Faculty Senate regarding missed class time and assignments, students who represent UNLV in any official extracurricular activity will also have the opportunity to make up assignments, provided that the student provides official written notification to the instructor no less than one week prior to the missed class(es).

The spirit and intent of the policy for missed classwork is to offer fair and equitable assessment opportunities to all students, including those representing the University in extracurricular activities. Instructorsshould consider, for example, that in courses which offer a "Drop one" option for the lowest assignment, quiz, or exam, assigning the student a grade of zero for an excused absence for extracurricular activity is both contrary to the intent of the Faculty Senate's policy, and an infringement on the student's right to complete all work for the course.

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This policy will not apply in the event that completing the assignment or administering the examination at an alternate time would impose an undue hardship on the instructor or the University that could reasonably have been avoided. There should be a good faith effort by both the instructor and the student to agree to a reasonable resolution. When disagreements regarding this policy arise, decisions can be appealed to the Department Chair/Unit Director, College/School Dean, and/or the Faculty Senate Academic Standards Committee.

For purposes of definition, extracurricular activities may include, but are not limited to: fine arts activities, competitive intercollegiate athletics, science and engineering competitions, liberal arts competitions, academic recruitment activities, and any other event or activity sanctioned by a College/School Dean, and/or by the Executive Vice President and Provost.

Rebelmail

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Diversity Statement

As an institution of higher learning, UNLV represents a rich diversity of human beings among its faculty, staff, and students, and is committed to aspiring to maintain a Campus environment that values that diversity. Accordingly, the University supports understanding and appreciation of all members of its community, regardless of race, sex, age, color, national origin, ethnicity, creed, religion, disability, sexual orientation, gender, gender identity, marital status, pregnancy, genetic

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information, veteran status, or political affiliation. Please see <u>University Statements and</u> <u>Compliance</u>, https://www.unlv.edu/about/statements-compliance.

A successful learning experience requires mutual respect and trust between the students and the instructor. Accordingly, the instructor asks that students be willing to listen to one another's points of view, acknowledging that there may be disagreements, keep discussion and comments on topic, and use first person, positive language when expressing their perspectives.

Public Health Directives

Face coverings are mandatory for all faculty and students in the classroom. Students must follow all active UNLV public health directives while enrolled in this class. UNLV public health directives are found at <u>Health Requirements for Returning to Campus</u>, https://www.unlv.edu/coronavirus/health-requirements. Students who do not comply with these directives may be asked to leave the classroom. Refusal to follow the guidelines may result in further disciplinary action according to the <u>UNLV Student Conduct Code</u>,

https://www.unlv.edu/sites/default/files/page_files/27/StudentConduct-Code.pdf, including being administratively withdrawn from the course.

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Since the COVID-19 pandemic forced some instruction to be delivered remotely starting in Spring 2020, numerous students have asked instructors to record their synchronous classes, so that they can access them at their convenience. Instructors who agree to record their classes (audio only, or video and audio) should inform students in advance. Recorded lectures may not be broadly

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released to anyone, but made available exclusively to those students enrolled in the class during the particular academic term. Recorded lectures must be stored securely, and are subject to the Nevada System of Higher Education's Records Retention Policy, meaning that the recordings can only be deleted 120 days after the end of class (i.e., after grades are posted). Once this requirement is met, the recordings should be deleted. Class recordings are protected from disclosure, as they are deemed part of an educational record under the Family Educational Rights and Privacy Act (FERPA).

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