UC 12317 13S

CBM003 ADD/CHANGE FORM

☒ Undergraduate Council	or	Graduate/Professional Studies Council
☐ New Course ☒ Course Change		☐ New Course ☐ Course Change
Core Category: WID Effective Fall 2013		Effective Fall 2013

1. Department: Physics College: NSM
2. Faculty Contact Person: Donna Stokes Telephone: 3-3588 Email: dstokes@uh.edu
3. Course Information on New/Revised course:
   - Instructional Area / Course Number / Long Course Title:
     PHYS / 3313 / Advanced Laboratory I
   - Instructional Area / Course Number / Short Course Title (30 characters max.)
     PHYS / 3313 / ADVANCED LABORATORY I
   - SCH: 3.00 Level: JR CIP Code: 40.0801.00 Lect Hrs: 0 Lab Hrs: 3
4. Justification for adding/changing course: **To meet core curriculum requirements**
5. Was the proposed/revised course previously offered as a special topics course? ☐ Yes ☒ No
   If Yes, please complete:
   - Instructional Area / Course Number / Long Course Title:
     ____ / ____ / _____
   - Course ID: _____ Effective Date (currently active row): _____
6. Authorized Degree Program(s): BA/BS
   - Does this course affect major/minor requirements in the College/Department? ☐ Yes ☒ No
   - Does this course affect major/minor requirements in other Colleges/Departments? ☐ Yes ☒ No
   - Can the course be repeated for credit? ☐ Yes ☒ No (if yes, include in course description)
7. Grade Option: Letter (A, B, C ...) Instruction Type: laboratory ONLY (Note: Lect/Lab info. must match item 3, above.)
8. If this form involves a change to an existing course, please obtain the following information from the course inventory: Instructional Area / Course Number / Long Course Title
   PHYS / 3313 / Advanced Laboratory I
   - Course ID: _____ Effective Date (currently active row): _____
9. Proposed Catalog Description: (If there are no prerequisites, type in "none".)
   Cr: 3. (0-3). Prerequisites: PHYS 1122, 1322, 3315, and credit for or concurrent enrollment in PHYS 3110. Description (30 words max.): Measurement of e/m, h/e, g; contemporary experiments in microwave diffraction and interference, quantized energy levels, energy distribution of beta-radiation, and chaotic systems.
10. Dean's Signature: _____ Date: _____
    Print/Type Name: _____

REQUEST FOR COURSES IN THE CORE CURRICULUM

Originating Department or College: Physics/NSM

Person Making Request: Donna Stokes Telephone: 713-743-3588

Email: dstokes@uh.edu

Dean's Signature: _____ Date: Click here to enter text.

Course Number and Title: Phys 3313 Advanced Laboratory I

Please attach in separate documents:

X Completed CBM003 Add/Change Form with Catalog Description

X Syllabus

List the student learning outcomes for the course (Statements of what students will know and be able to do as a result of taking this course. See appended hints for constructing these statements):

Upon completion of this course, students will be able to: (1) Understand the key experiments that led to the formulation of Modern Physics; (2) Perform those experiments for themselves; (3) Use contemporary laboratory equipment; (4) Understand the basics of error analysis; (5) Keep a laboratory notebook; (6) Communicate the purpose, procedures, and results of an experiment in the form of a scientific journal article in the style of the American Institute of Physics; (7) Communicate the purpose, procedures, and results of an experiment orally

Component Area for which the course is being proposed (check one):

*__Note:__ If you check the Component Area Option, you would need to also check a Foundational Component Area.

☐ Communication ☐ American History

☐ Mathematics ☐ Government/Political Science

☐ Language, Philosophy, & Culture ☐ Social & Behavioral Science

☐ Creative Arts X-WID Component Area Option

X Life & Physical Sciences

Competency areas addressed by the course (refer to appended chart for competencies that are required and optional in each component area):

X Critical Thinking
X Communication Skills
X Empirical & Quantitative Skills
X Teamwork
☐ Social Responsibility
☐ Personal Responsibility

Because we will be assessing student learning outcomes across multiple core courses, assessments assigned in your course must include assessments of the core competencies. For each competency checked above, indicated the specific course assignment(s) which, when completed by students, will provide evidence of the competency. Provide detailed information, such as copies of the paper or project assignment, copies of individual test items, etc. A single assignment may be used to provide data for multiple competencies.

Critical Thinking:
Students will conduct 7 laboratory experiments and write laboratory reports which will be used to assess critical thinking.

Communication Skills:
Students will write lab reports in the format of a scientific journal article based on the style of the American Institute of Physics. These lab reports will be used to assess written communication skills.

Empirical & Quantitative Skills:
Students will conduct laboratory experiments which require complete and detailed error analysis. This analysis will be included in the written laboratory reports for each experiment and will be used to assess empirical and quantitative skills.

Teamwork:

Students will conduct experiments in groups of 2-3 students. The student will write lab reports for each experiment which will be used to assess teamwork.

Social Responsibility:
Click here to enter text

Personal Responsibility:
Click here to enter text

Will the syllabus vary across multiple section of the course? ☐ Yes X No
If yes, list the assignments that will be constant across sections:
Click here to enter text

Inclusion in the core is contingent upon the course being offered and taught at least once every other academic year. Courses will be reviewed for renewal every 5 years.

The department understands that instructors will be expected to provide student work and to participate in university-wide assessments of student work. This could include, but may not be limited to, designing instruments such as rubrics, and scoring work by students in this or other courses. In addition, instructors of core courses may be asked to include brief assessment activities in their course.

Dept. Signature: _____

UNIVERSITY of HOUSTON

COLLEGE OF NATURAL SCIENCES & MATHEMATICS HTTP://NSM.UH.EDU

COURSE TITLE/SECTION: Phys 3313, Advanced Laboratory I, Fall 2012/20194

TIME: Phys 3313, Th 1 – 4 pm LOCATION: S 214

FACULTY:	Dr. Rebecca Forrest	Dr. Seamus Curran
OFFICE:	SR1 515 C	SR1 517 A
OFFICE HOURS:	M-W 1 – 2 pm, or by appointment	Th 10 am - 12 pm, or by appointment
E-mail:	rforrest@uh.edu	sacurran@uh.edu
Web Page:	http://www.phys.uh.edu/~rforrest/	
Phone:	(713) 743-3507	(832) 671-6647
Fax:	(713) 743-3589	

I. Course

Formerly Phys 3113. Cr. 3. (0-6). Prerequisites: PHYS 1122, 1322, 3315, and credit for or concurrent enrollment in PHYS 3110. Measurement of e/m, h/e, g; contemporary experiments in microwave diffraction and interference, quantized energy levels, energy distribution of beta-radiation, and chaotic systems. Core – Writing in the Discipline.

II. Course Learning Objectives

Upon completion of this course, students will be able to:

1. Understand the key experiments that led to the formulation of Modern Physics
2. Perform those experiments for themselves
3. Use contemporary laboratory equipment
4. Understand the basics of error analysis
5. Keep a laboratory notebook
6. Communicate the purpose, procedures, and results of an experiment in the form of a scientific journal article in the style of the American Institute of Physics
7. Communicate the purpose, procedures, and results of an experiment orally

III. Course Content

The course will include the following topical (content) areas:

1. Fundamentals
   - Measurement & Error (*)
2. Mechanics & Waves
   - Kater's Pendulum (*)
   - Microwave Optics
3. Modern Physics
   - Photoelectric Effect (h/e) (*)
   - Franck-Hertz Experiment
   - Bainbridge Method (e/m) (*)
   - β-Spectroscopy
   - Young's Double Slit Experiment

(*) Experiments that require complete and detailed error analysis.

VI. **Teamwork Component:** Students will work in teams of 2-3 students to conduct 8 experiments. Each student will record data from the experiment in their lab notebook and this will be used to write a formal lab report. Each member of the team must be an active participant in conducting the experiment. You will be assessed on how well you work together as a team.

V. Textbooks

Text Book: Experiments in Modern Physics
A.C. Melissinos
Academic Press 2003

Additional Reading: Writing About Physics Using LATEX
S. D. Sewell
Advanced Lab Handout

LabWrite, http://www.ncsu.edu/labwrite/

The Art of Experimental Physics
D.W. Preston, E.R. Dietz
John Wiley & Sons 1991

Practical Physics
G.L. Squires
Cambridge University Press 2001

Introduction to Error Analysis
J.R. Taylor
University Science Books 1996

VI Course Requirements

A. Reading Assignments

Read handouts for each experiment and answer the Preparatory Questions before coming to the lab. Answers to the Preparatory Questions are to be in your lab notebook at the beginning of lab, along with the Objective, Procedure summary, and Analysis summary for the day's experiment.

B. Written Assignments

During lab, keep records of all experimental work in your lab notebook as described herein, in the Advanced Lab handout, and in LabWrite. While all analyses do not have to be done in your notebook, a summary of the analyses and the results should be in your notebook.

Prepare an experimental report for each experiment as described below, in the Advanced Lab handout, and in LabWrite.

VII. Evaluation and Grading

60% Experimental Students are expected to work in pairs. There will be one introductory

	Reports:	experiment covering one lab period (3 hours) and six experiments covering two lab periods each. Each student is expected to turn in Experimental Reports on all of the seven experiments, worth 10 points each. The reports should be three to four pages in the style of the American Institute of Physics publications (e.g. Journal of Applied Physics). Students are encouraged to use TeX or MS Word to prepare their reports; TeX and MS WORD template files are available at http://www.aip.org/pubservs/compuscript.html. Sample TeX and MSWord reports are available at Dr. Forrest's web page. Late reports will lose one point per weekday. They will not be accepted after 5 weekdays late (one week). A lab report rubric is included in the Advanced Lab Handout.
30%	Notebook:	Students are required to use laboratory notebooks during every lab. All writing should be in ink. Only bound, ruled and numbered notebooks are allowed. Lab Notebooks may be purchased at UH Research Stores, room 209, "Old" Science Bldg. During the experiments, students are not to use loose sheets of paper or anything else except their notebook to record experimental data and notes. Data may be plotted on Graph Paper and then glued into the notebook. One notebook per student. These will be periodically evaluated, and turned in and graded at the end of the semester. Grading criteria will be presented during a 3110 seminar.
10%	Oral Exam:	Students will have one oral or practical exam at the end of the semester. Questions will pertain to the experiments completed by the student.

VIII. Additional Notes

Policy on grades of I (Incomplete): The grade of "I" (Incomplete) is a conditional and temporary grade given when a student, for reasons beyond his or her control, has not completed a relatively small portion of all requirements. Sufficiently serious, documented situations include illness, death in the family, etc.

Addendum: Whenever possible, and in accordance with 504/ADA guidelines, the University of Houston will attempt to provide reasonable academic accommodations to students who request and require them. Please call 713-743-5400 for more assistance.

Academic Dishonesty: It is each student's responsibility to read and understand the Academic Honesty Policy found in the Student Handbook, which can be found at http://www.uh.edu/dos/hdbk/acad/achonpol.html. Please see following website for information regarding academic dishonesty www.uh.edu/honpol.

Religious Holy Days: Students whose religious beliefs prohibit class attendance or the completion of specific assignments on designated dates may obtain an excused absence. To do so, please make a written request for an excused absence and submit it to your instructor as soon as possible, to allow the instructor to make arrangements. For more information, see the Student Handbook. http://www.uh.edu/dos/publications/handbook.php

Standard Disclaimer: This syllabus is subject to change at the discretion of the instructor.

PHYS 3313, 1 - 4pm Th
Fall 2012

Dr. Rebecca Forrest - rforrest@uh.edu
Dr. Seamus Curran - sacurran@uh.edu

	Group 1		Group 2		Group 3		Group 4		Group 5		Group 6		Group 7	
	Experiment	Report Due	Experiment	Report Due	Experiment	Report Due	Experiment	Report Due	Experiment	Report Due	Experiment	Report Due	Experiment	Report Due
30-Aug	Introduction, Lab Safety Presentation													
6-Sep	Measurement and Error Lab													
13-Sep	e/m		hc		Kater's Pend		Micro. Optics		Frank-Hertz		Double Slit		Beta Spec	
20-Sep	e/m	M & E	hc	M & E	Kater's Pend	M & E	Micro. Optics	M & E	Frank-Hertz	M & E	Double Slit	M & E	Beta Spec	M & E
27-Sep	Beta Spec		e/m		hc		Kater's Pend		Micro. Optics		Frank-Hertz		Double Slit	
4-Oct	Beta Spec	Lab 2	e/m	Lab 2	hc	Lab 2	Kater's Pend	Lab 2	Micro. Optics	Lab 2	Frank-Hertz	Lab 2	Double Slit	Lab 2
11-Oct	Double Slit		Beta Spec		e/m		hc		Kater's Pend		Micro. Optics		Frank-Hertz	
18-Oct	Double Slit	Lab 3	Beta Spec	Lab 3	e/m	Lab 3	hc	Lab 3	Kater's Pend	Lab 3	Micro. Optics	Lab 3	Frank-Hertz	Lab 3
25-Oct	Frank-Hertz		Double Slit		Beta Spec		e/m		hc		Kater's Pend		Micro. Optics	
1-Nov	Frank-Hertz	Lab 4	Double Slit	Lab 4	Beta Spec	Lab 4	e/m	Lab 4	hc	Lab 4	Kater's Pend	Lab 4	Micro. Optics	Lab 4
8-Nov	Micro. Optics		Frank-Hertz		Double Slit		Beta Spec		e/m		hc		Kater's Pend	
15-Nov	Micro. Optics	Lab 5	Frank-Hertz	Lab 5	Double Slit	Lab 5	Beta Spec	Lab 5	e/m	Lab 5	hc	Lab 5	Kater's Pend	Lab 5
22-Nov	Thanksgiving		Thanksgiving		Thanksgiving		Thanksgiving		Thanksgiving		Thanksgiving		Thanksgiving	
29-Nov	Kater's Pend	Lab 6	Micro. Optics	Lab 6	Frank-Hertz	Lab 6	Double Slit	Lab 6	Beta Spec	Lab 6	e/m	Lab 6	hc	Lab 6
6-Dec	Kater's Pend		Micro. Optics		Frank-Hertz		Double Slit		Beta Spec		e/m		hc	
13-Dec	Thu 2 - 5pm Oral/Practical Exam													
18-Dec	Tuesday, Lab 7 & notebook due													

Sep. 12 - Last Day to Drop Without a grade

Nov. 2 - Last Day to Drop with a W

Group 1

Group 2

Group 3.

Group 4

Group 5

Group 6

Group 7.

Writing About Physics Using LaTeX

S.D. Sewell*
MIT Department of Physics and
edited by R. Forrest
University of Houston
(Dated: August 10, 2009)

We present a written summary template for use by UH Junior Lab students, using LaTeXand the **RevTeX-4** macro package from the American Physical Society. This is the standard package used in preparing most Physical Review papers, and is used in many other journals as well. The individual summary you hand in should show evidence of your own mastery of the entire experiment, and possess a neat appearance with concise and correct English. The abstract is essential. It should briefly mention the motivation, the method and most important, the quantitative result with errors. Based on those, a conclusion may be drawn. The length of the paper should be no more than 2 double-sided pages including all figures.

1. WRITING PAPERS IN THE PHYSICS COMMUNITY

An important part of your education as a physicist is learning to use standard tools which enable you to share your work with others. In Junior Lab, we will instruct you in the use of LaTeXon your own personal Windows machine to write scientific papers in a widely accepted professional style. This source file (sample-paper.tex) for this document should be used as a template for your Junior Lab papers. Spending a few hours studying and altering this document will allow you to develop sufficient mastery of LaTeXto easily generate all manner of technical documents. Specific instructions for compiling LaTeXdocuments on Windows systems are contained in the Appendices.

The introduction section should succinctly report the motivation, purpose and relevant background to the experiment.

2. GUIDELINES FOR GOOD WRITING [4]

The essence of expository writing is the communication of understanding through a clear and concise presentation of predominately factual material. Most people cannot compose successful expository prose unless they put the need to communicate foremost among their priorities. Two things predominate in generating understanding in the reader:

1. ORGANIZATION: The reader must be provided with an overview or outline, know how each fact that he reads fits into that overall picture, and he must be alerted if it is an especially important fact. Furthermore, the facts must be presented in a logical order (so that fact 17 is not important for understanding fact 12)

2. UNIFORM DEPTH of PRESENTATION: Bearing in mind the preexisting knowledge of the reader, the writer must budget the length of discussion allotted to each topic in proportion to its importance.

Of course clarity of presentation and elegance of explanation will greatly enhance the ease and pleasure of understanding; still, a murky explanation can be fairly useful if the reader has been told what he is reading about and where it fits into the overall scheme of things - especially if the reader is familiar with the general subject matter under discussion.

The Junior lab writeup is one of the few opportunities undergraduates are given to practice technical writing. Thus we urge you to concentrate on your overall presentation, not only on the facts themselves. We strongly recommend that you:

1. Base your report on an outline.

2. Begin each paragraph with a topic sentence which expresses the main area of concern and the main conclusion of the paragraph. Put less important material later in the paragraph

Point 2 is frequently absent in 8.13 reports; they are your mechanism for telling the reader what the topic under discussion is and where it fits into the overall picture.

You can check your topic sentences by reading them in order (i.e. omit all the following sentences in each paragraph) - this should give a fair synopsis of your paper.

If you are individually writing up results you obtained with a partner, use we and I appropriately.

Use the past tense for your procedure and analysis, the past perfect for preparation and the present for emphasis or conclusions, e.g. Since we had previously installed Matlab, we quickly concluded that electrons are waves.

1. Be sure your Figures have comprehensible captions.

2. Make a complete estimate of your errors (not just statistical) - even if it's crude

3. Trace origin of formulae you use (eg. Moseley's Law) to well known physics (in this case to the

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Bohr atom) - don't derive, just indicate what new assumptions are needed.

Please consult the MIT's Online Writing and Communications Center's web page at `http://web.mit.edu/writing/` for further guidance in all aspects of writing, style and to make appointments with consultants for free advice. They even have an on-line tutor to which you can submit sections of your paper for critique at any stage of the writing process!!!

Lastly: Remember to proofread your paper for spelling and grammar mistakes. Few things are as offensive to a reviewer as careless writing and such mistakes will count against you!

3. THEORY

The report should be type-written in a form that would be suitable for submission as a manuscript for publication in a professional journal such as the American Journal of Physics - Physical Review Letters, `http://prl.aps.org/`. One helpful website is the APS Physics Review Style and Notation Guide at `http://publish.aps.org/STYLE/`. Figures (created as PDF files) should be inserted into the text in their natural positions. The body of the summary should include a discussion of the theoretical issues addressed by the experiment. This should be done at a level, so that another student could follow your development.

3.1. Typesetting Mathematics

One of the great powers of LaTeXis it's ability to typeset all manner of mathematical expressions. While it does take a short while to get used to the syntax, it will soon become second nature. Numbered, single-line equations are the most common type of equation in *Junior Lab papers* and are usually referenced in the text: e.g. see Equation (1).

$$\chi_{-}(p) \propto [2|\mathbf{p}|(|\mathbf{p}| + p_z)]^{-1/2} \begin{pmatrix} |\mathbf{p}| + p_z \\ px + ip_y \end{pmatrix} \qquad (1)$$

Mathematics can also be placed directly in the text using delimeters: $\vec{c_1} \equiv \langle c_1 \rangle \equiv c_0|0\rangle + c_1|1\rangle$, $\lambda^2 \approx \prod \sum \left\{ \frac{y_i - f(x_i;\ldots)}{\sigma_i} \right\}^2$, $\chi^2_\nu \sim \lim_{n\to\infty} p(x;n) \geq \frac{1}{\sqrt{2\pi\sigma}} e^{-u-u^2-2u} P(x) \ll \int_{-\infty}^{x} p(x')dx'$, $a \times b = c \Rightarrow \nabla h$.

Infrequently, you may wish to typeset long equations which span more than one line of a two-column page. A good solution is to split-up the equation into multiple lines and label all with a single equation number, like in Equation 2. See the LaTeXfile to see how this is done.

$$\sum M_{fi}^{\text{spin }2} = g_S^{2n-4}(Q^2)\, N^{n-2}(N^2-1) \times \left(\sum_{i<j}\right) \sum_{\text{perm}} \frac{1}{S_{12}} \frac{1}{S_{12}} \sum_{\tau} e_\tau^f \qquad (2)$$

Finally, it is often useful to group related equations to denote their 'relationship, e.g. in a derivation. Enclosing single-line and multiline equations in `\begin{subequations}` and `\end{subequations}` will produce a set of equations that are "numbered" with letters, as shown in Equations. (3a) and (3b) below:

$$\left\{ abc123456abcdef\alpha\beta\gamma\delta1234556\alpha\beta \frac{1}{A^2} \frac{\sum^a_b}{} \right\} \qquad (3a)$$

$$\mathcal{M} = ig_Z^2(4E_1E_2)^{1/2}(l_i^2)^{-1}(g_{\sigma_2}^e)^2\chi_{-\sigma_2}(p_2) \times [\bar{c}_{\sigma_3}\gamma_{\sigma_1}\chi_{\sigma_1}(p_1)]. \qquad (3b)$$

4. EXPERIMENT

This section describes the main components of the apparatus, procedures used and always makes reference to a figure(s) which contains a block diagram or schematic of the apparatus and perhaps includes the most important signal processing steps. **The figure should be referenced as early as possible in this section with the placement of the figure as close to the descriptive text as is possible.** It is usually necessary to place additional information within the figures themselves or in their captions for which there is no room in the main body of text. This will help you stay within the two page limit.

Example first sentence of an experimental section The experimental apparatus consists of a specially prepared chemical sample containing $^{13}CHCl_3$, a NMR spectrometer, and a control computer, as shown in Figure 1.

Graphics, such as Figure 2 should be well thought out and crafted to maximize their information content while retaining clarity of expresson! If you 'reuse' graphics from your paper in oral presentation slides, make sure to increase the size of all the fonts so that they remain legible from 20 feet away!

5. DATA AND ANALYSIS

All papers should have at least one graphic showing some assemblage of raw data, see for example Figure 3. There should also be one graphic which summarizes the experimental data, and which conveys primary finding(s) of the laboratory exercise. You may find that you need more but these two should be a minimum. Finally, it

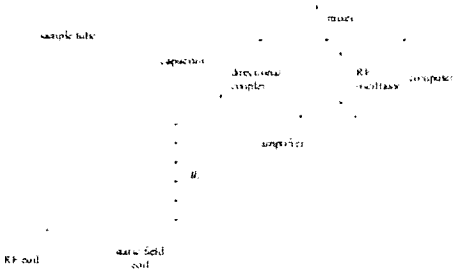

FIG. 1: This is a schematic of the main apparatus. Use the caption space to elaborate on specific issues or complication, or operating procedures. Especially valuable given the limited about of space in the main body of text. The size of this graphic was set by the width command, the aspect ratio defaults to 1.0 if the height is not also set. Adapted from [1, 2].

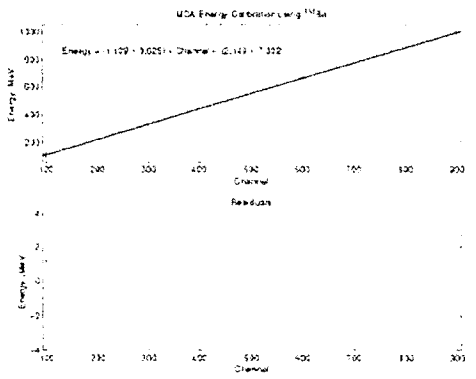

FIG. 2: Sample figure describing a set of data, fit procedures and results. Use the caption space to provide more details about the fitting procedure, results or implications if you do not have sufficient room in the main body of text. The size of this graphic was set relative to the textwidth, see the TeX file for details

can be useful in some circumstances to have a table of results, see Table I

Try to avoid the temptation to inundate the reader with too many graphics. It is worth spending some time thinking of how best to present information rather than just creating graph after graph of uninformative data. All figures and tables must be properly captioned. Material and ideas drawn from the work of others must be properly cited, and a list of references should be included at the end of the text but before the graphics

If circumstances in an experiment are such that you cannot get your own data (e.g. broken equipment, bad weather), **you may use somebody else's data provided you acknowledge it**

TABLE I: A example table with footnotes. Note that several entries share the same footnote. Inspect the LaTeX input for this table to see exactly how it is done.

	r_i (Å)	r_0 (Å)	κr_0		r_c (Å)	r_0 (Å)	κr_0
Cu	0.800	14.10	2.550	Sn[a]	0.680	1.870	3.700
Ag	0.990	15.90	2.710	Pb[a]	0.450	1.930	3.760
Tl	0.480	18.90	3.550				

[a]Here's the first, from Ref [3].

6. CONCLUSIONS

And finally, conclusions. Remember to report all your results with appropriate significant digits, units, and uncertainties, e.g. $Q = (2.12 \pm 0.06)$ disintegrations s^{-1}. It is often very useful to express the quality of your result by measuring how many standard deviations it lies from other published values.

It is worth mentioning here some thoughts on **ethics and writing in Science**

When you read the report of a physics experiment in a reputable journal (e.g. Physical Review Letters) you can generally assume it represents an honest effort by the authors to describe exactly what they observed. You may doubt the interpretation or the theory they create to explain the results. But at least you trust that if you repeat the manipulations as described, you will get essentially the same experimental results.

Nature is the ultimate enforcer of truth in science. If subsequent work proves a published measurement is wrong by substantially more than the estimated error limits, a reputation shrinks. If fraud is discovered, a career may be ruined. So most professional scientists are very careful about the records they maintain and the results and errors they publish.

In keeping with the spirit of trust in science, Junior Lab instructors will assume that what you record in your lab book and report in your written and oral presentations is exactly what you have observed.

Fabrication or falsification of data, using the results of another person's work without acknowledgement, or copying from *"living group files"* are intellectual crimes as serious as plagiarism, and possible causes for dismissal from the Institute.

The acknowledgement of other people's data also applies to the use of other people's rhetoric. The appropriate way to incorporate an idea which you have learned from a textbook or other reference is to study the point until you understand it and then put the text aside and state the idea in your own words.

One often sees, in a scientific journal, phrases such as "Following Bevington and Melissinos [1, 3] ." This means that the author is following the ideas or logic of these authors and not their exact words

If you do choose to quote material, it is not sufficient just to include the original source among the list of refer-

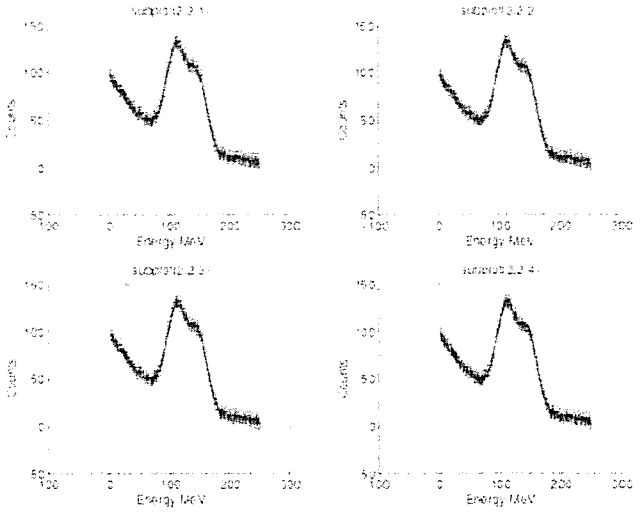

FIG. 3: Sample paneled figure created in Matlab using the subplot(2,2,x) command where x is the element of the plot array into which all subsequent commands such as plot(x,y) and xlabel('Volts'), etc. get processed. Use the caption space to provide more details about the data, their acquisition or how they were processed if you do not have sufficient room in the main body of text. Figures can be rotated using the angle command, see the TeX file for details. If a figure is to be placed after the main text use the "figure*" option to make it extend over two columns, see the LaTeXfile for how this was done.

ences at the end of your paper. If a few sentences or more are imported from another source, that section should be

> indented on both sides or enclosed in quotes, and attribution must be given immediately in the form of a reference note.[1]

If you have any question at all about attribution of sources, please see you section instructor.

7. REFERENCES

Bibliographies are very important in Junior Lab papers. Beyond the requisite citation of source material, they provide evidence of your investigations beyond the narrow scope of the labguide, something explicitly required of all Junior Lab students! Good bibliograhies are doubly important in the real world where they are very (often the most) important sources of information for researchers entering the field. Bibliographic entries may be made either in the '.tex' file itself or within a separate '.bib' file which gets attached during process of building a final PDF document. This latter method is the preferred method and is then one used in this template by default. An example of the alternative style, currently commented out, is contained in the '.tex' source file

[1] Melissinos, A.C., Experiments in Modern Physics - 1st Edition, Academic Press, [1966]
[2] Melissinos, A.C., Napolitano, J., Experiments in Modern Physics - 2nd Edition, Academic Press, [2003]
[3] Bevington and Robinson, Data Reduction and Error Analysis for the Physical Sciences - 3rd Edition, McGraw-Hill, [2003]
[4] Professor D. Pritchard, Personal Communication

Acknowledgments

FAC gratefully acknowledges Dr. Francine Brown for her early reviews of this manuscript

8. USING LaTeX UNDER WINDOWS

For those students who would like to use a Windows platform, TexMaker is a LaTex editor available for free at

http://www.xmlmath.net/texmaker/. You can also try MiKTeX (pronounced *mik-tech*, a freely available implementation of TeX and related programs available from `www.miktex.org`. Note that MiKTeX itself runs from a command line prompt and is not terribly convenient. Once you've installed the above software, you can obtain the .tex file on http://www.phys.uh.edu/~rforrest/ and put it on your Windows machine in order to 'rebuild' this document from scratch.

If you wish to view postscript files under Windows, we suggest downloading and installing Ghostscript available from `www.cs.wisc.edu/~ghost`.

Phys 3313, Advanced Lab
Laboratory Report Grading Rubric

	Comments	Points	
		Max	Earned
Title • Identifies experiment adequately and briefly • Cites author first, lab partner(s) second, course, and date		0.4	
Abstract • Summarizes the full report concisely and effectively • Reports final result with uncertainty		0.5	
Introduction • Establishes concept of experiment • Establishes context of experiment • States purpose, and hypothesis if appropriate • Includes all equations used, defines all variables		1.0	
Experimental Method • Describes materials & equipment (in paragraphs, not lists) • Describes procedures (in paragraphs) • Briefly gives enough detail to allow replication of the experiment • Uses own words, not a copy of the manual		1.0	
Results and Analysis, and Discussion • Uses text to describe data, refers to any tables and/or graphs • Uses tables and/or graphs appropriately • Any tables/graphs have captions/titles, appear in order mentioned in text, and are correctly labeled • All necessary results reported – Instructor should be able to confirm analysis using the data presented		2.3	
Results and Analysis, and Discussion • Uses text to describe analysis, refers to any tables and/or graphs • Uses tables and/or graphs appropriately • Any tables or graphs have captions/titles, are shown in order mentioned in text, and are correctly labeled • Correctly shows or summarizes all necessary calculations– instructor should be able to confirm calculations based on what is discussed • Discusses scientific content & context of results, and relates them to the objective and/or hypothesis		2.3	
Conclusion (i.e. Summary) • States whether the purpose was accomplished, and/or hypothesis was supported • Backs this up by referring to results • Reports final result with uncertainty • Answers any questions posed in the lab manual • Addresses any pertinent issues; summarizes discussion, possible sources of error, possible experimental improvements, what has been learned, etc.		1.0	
References • Appropriate references listed • Listed in order referred to in text, in a standard format		0.5	
Writing Proficiency and Format • Uses specified report organization • Uses correct grammar, spelling, and punctuation • Presents ideas clearly, concisely, and logically		1.0	
Overall Grade		10	