Course Description: This course consists of a series of lectures and experiments to explore and demonstrate the fundamentals of electronics and computer data acquisition. The principles of these disciplines will be applied to the development of chemical instrumentation.

Credits: 2

Lecture: Mondays, 1:00–2:00 pm, Humanities Room 3018

Labs: Section 1: Tuesdays, 1:00 – 6:15 pm Chemistry Room 510
      Section 2: Wednesdays, 1:00 – 6:15 pm Chemistry Room 510
      Section 3: Thursdays, 1:00 – 6:15 pm Chemistry Room 510

Office Hours: Dr. Christian Burger (christian.burger@stonybrook.edu), Chem 423, Tue 10–11am;
              Waldemar Nieweglowski (eufolk@gmail.com), TBA;
              Lizhou Nie (2012lnie@gmail.com), TBA;
              Xiaowei Li (xiaowei.li@stonybrook.edu), TBA.

Course Materials:

Required:

CHE 304 Manual: Chemical Instrumentation Laboratory (provided as PDF on Blackboard):
   This manual gives detailed instruction for the experiments, but a bare minimum of the principles. It is essential for students to attend the lecture to fully understand the principles covered by the manual, and it is highly recommended to also consult other standard textbooks. The sections of the manual will be available for downloading in PDF format from the course Blackboard site (see below). To allow for last minute updates to the manual, do not print out a copy of a manual section until it is needed.

Electronics Kit (provided):
   The Kit consists of a collection of consumable electronics parts (resistors, capacitors, diodes, transistors, integrated circuit chips) that you will need to build circuits throughout the course.

Laboratory Research Notebook (e.g., National Brand #43-644):
   You can purchase it at the on-campus Bookstore. It lets you make two copies without using carbon paper. Use it to draw all circuits you build and to record all observed results, annotations and calculations. Use it as a scratch pad. The purpose of the Lab Notebook is to draw and record all observations (and not to keep a neat record; a comprehensive notebook will be necessarily a little messy). Before you leave the lab, hand in the carbon copies to your TA (photocopies are not acceptable).

USB Flash Drive:
   You will need some media for storage of data from the computers in the laboratory, such as a USB flash drive. It is recommended to back up your files at every opportunity. You cannot count on files staying on a laboratory computer from one period to the next.
Recommended:

*Practical Electronics for Inventors, by Paul Scherz; McGraw Hill.*

This is a good supplement for the material in the course, containing much more detail and a greater variety than the manual. It will also be a good reference that will be useful long after the course ends. The 3rd edition was just published (Jan 2013) but the 2nd and even the 1st edition are still acceptable for this course.

*Learning with LabVIEW Express, by Robert Bishop; Prentice Hall.*

This book provides a much more comprehensive program for learning LabVIEW than we can provide during the course. It is recommended for anyone who anticipates wanting to continue to improve these programming skills. Versions 7 and up are recommended. Used copies are usually very affordable.

**Information on the Web:**

Our course web page is located at: https://blackboard.stonybrook.edu. Announcements, staff information, the course manual, reference material, grades, and this document will be posted on the Blackboard site. Make sure your e-mail address is up-to-date in Blackboard as it will occasionally be used to contact you for last-minute announcements or with regard to your work.

**Outline of the Experiments:**

(I) Passive Circuits / Oscilloscope  
(II) Diodes and Transistors  
(III) Operational Amplifiers  
(IV) Computer Control and Data Acquisition  
(V) Applications

See the “Lab Schedule” below for details.

Each student will individually and independently do every specified experiment of Parts I through III. Instructions for each of these experiments will be found in the *Manual.* Perform the experiments “at your own pace”, which means you do not have to finish a certain set of experiments in a given afternoon, but the deadline for submission of the lab reports will be enforced (see below).

An experiment is considered completed when your circuit appropriately responds to the specified set of input signals and you have recorded the appropriate data in your notebook.

For Parts IV and V, find a partner to form a 2-student group. (If the total number of students in a lab section is odd, there will be one 3-student group). The experiments of Part V are applications of electronics to chemical problems. Each student will submit an individual lab report for each of Parts I through V. For the required format of the reports, see “Reports” in this Syllabus.

Lab reports are due one week after the completion date for each of Parts I to IV as well as Va and Vb, as specified in the “Schedule” (see below). You will need to hand in a printed hardcopy and submit an electronic copy (PDF is preferred but any word processing file format will be accepted). The penalty for late lab reports will be 1 point (out of a total of 100 points) per work day, i.e., 5 points per week.
Grading Basis: [Total = 100%]

Lab Reports:
- Part I 15%
- Part II 15%
- Part III 20%
- Part IV/Va 20%
- Part Vb 20%

Miscellaneous: (Quizzes, etc.) 10%

Disability Support Services (DSS) Statement:
If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact Disability Support Services (631) 632-6748 or http://studentaffairs.stonybrook.edu/dss/. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website: http://www.stonybrook.edu/ehs/fire/disabilities.
If you have any condition, such as a physical, psychological, medical or learning disability which may make it difficult for you to carry out the work as we have outlined it or which will require extra time on examinations, we would urge that you contact the staff in the Disabled Student Services Office (DSS), Room 133 Humanities, 632-6748, as soon as possible. The DSS will review your concerns and determine, with you, what accommodations are necessary and appropriate. All information and documentation of disability will be kept confidential by DSS.

Academic Integrity Statement:
Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instance of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/

Critical Incident Management:
Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, and/or inhibits students' ability to learn.

Lab Reports:
The lab reports will be graded for their appropriate presentation of all data and for a logical discussion leading up to a conclusion. If the results are not in agreement with an expectation, you are expected to repeat the experiment(s) until reasonable results are obtained.

In order to proceed efficiently, it is important that you go into the lab knowing what you are supposed to do for the afternoon, and with a good idea about what you expect to observe. It will be advantageous to you to repeat the experiment on the same day whenever the results you have obtained “do not look good.”

It is expected that the report will be written in good English, and the quality of writing will be considered in the grading. You are encouraged to use spelling and grammar checkers contained in most popular word processors. For those who need it, additional writing help will be provided through CHE 385. Students do not have to be enrolled in that course to obtain help with their CHE 304 reports.

A concise report is preferred. In general, the CHE 304 lab report format is similar to that used by CHE 303, but there are also some differences, as well as differences from one experiment to the next. Details about the required format for CHE 304 lab reports will be announced in the lecture.
**Tentative Lecture Schedule**

Jan 28  Course outline; Resistors, Capacitors, Inductors  
Feb 4    RC, RL circuits  
Feb 11   Diodes, Rectifiers  
Feb 18   Zener diodes, Transistors  
Feb 25   Transistors, Power supply  
Mar 4    OpAmps: Inverting configuration, Adder, Comparator  
Mar 11   Computer data acquisition, Binary I/O, Analog-to-digital conversion  
Mar 18–24  Spring Break  
Mar 25   Digital-to-analog conversion, Counters and timers  
Apr 1    LabView programming  
Apr 8    LabView programming  
Apr 15   LabView programming  
Apr 22   Overview of chemical instrumentation  
Apr 28   Overview of chemical instrumentation  
May 6    Overview of chemical instrumentation  

**Laboratory Schedule**

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<thead>
<tr>
<th>Dates</th>
<th>Lab Schedule</th>
<th>Reports</th>
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<tbody>
<tr>
<td>Jan. 29/30/31</td>
<td>Oscilloscope, [I] Voltage divider.</td>
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<tr>
<td>Feb. 5/6/7</td>
<td>[I] RC, RL circuits.</td>
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<td>Feb. 19/20/21</td>
<td>[II] Zener diodes, transistors.</td>
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<tr>
<td>Mar 18–24</td>
<td>Spring Break.</td>
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<tr>
<td>Apr. 9/10/11</td>
<td>[Va] Project I: Spectrophotometer.</td>
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<tr>
<td>Apr. 16/17/18</td>
<td>[Va] Project I: Spectrophotometer.</td>
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<tr>
<td>Apr. 30/May 1/2</td>
<td>[Vb] Project II: Autotitrator.</td>
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<td>May 7/8/9</td>
<td>CHECKOUT</td>
<td>Report Vb due.</td>
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