BIOLOGICAL SCIENCES 329
INTRODUCTION TO EXPERIMENTAL TECHNIQUES
96-2

INSTRUCTOR: Doug Wilson

PRE-REQUISITES: LOWER DIVISION CORE COURSES ARE ASSUMED, IN PARTICULAR -
BICH 221 (or BISC 201), CHEM 102, 115, PHYS 102.

THE COURSE:

The overriding goal is to develop competence with quantitative techniques and instrumentation. More
specifically, the objectives are to: (1) provide experience in learning a new technique or mastering a new
instrument to a level of understanding sufficient for its intelligent application to obtain good results; (2)
review any physics and chemistry necessary for understanding the techniques or instruments; (3) provide
students with laboratory experience, including carrying out simple prescribed experiments, keeping
notebooks, analysis of results using computers and writing of reports; (4) teach how to deal with variation in
results and measurement errors using statistics; (5) improve problem solving and numerical skills and
demonstrate the relevance of math, physics and chemistry to biological research.

Teaching will be done primarily through the lab exercises and a text prepared by the instructor. The
material for each unit, which serves as the course text, will be distributed the week prior to the week the unit
is done. A worksheet, to be completed for most units, is intended to provide instruction in data reporting
and analysis and to evaluate the student's lab work. At the beginning of the lab session, a quiz is given,
equipment operation is usually demonstrated and occasionally a difficult concept is discussed. The time
remaining is used for lab work.

The lectures supplement the exercises and the text. You are expected to read the text before the first lecture
on the subject. An overview of each topic will be given, some applications will be described, and some
information and concepts not given in the text will be presented.

EVALUATION AND GRADING:

EXAMS: Exams I, II and III will be held during the lecture period; Exam IV during exam
week. They are weighted equally.

Exam I.................covering units 1 and 2
Exam II.................covering units 3 to 5
Exam III...............covering units 6 to 8
Exam IV..............covering units 9 to 12

GRADING: Lab Units...............30%
Lab Quizzes .............10%
Exams.....................60% (15% each)
<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture Topics</th>
<th>Lab Session</th>
<th>Lab Unit</th>
<th>Description</th>
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</table>
| 1    | Microcomputer Fundamentals  
       Computer Spreadsheet Concepts                                                | 1           | 1        | Data Analysis with Excel            |
| 2    | Statistical Description of Measured Data Errors in Measurement                  | 3           | 2        | Statistical Inference               |
| 3    | Sampling and Statistical Inference  
       Concepts of Statistical Inference                                                | 5           | 3        | Electrical Measurement              |
| 4    | Fundamental Concepts of DC Circuits  
       Electrical Measurement in Biology                                              | 7           | 4        | Electrical Transducers              |
| 5    | How Transducers Work  
       Exam I                                                                 | 9           | 5        | pH and Buffers                      |
| 6    | Measuring pH with the Glass Electrode  
       pH Buffer Systems                                                             | 11          | 6        | Oxygen Measurement                  |
| 7    | Oxygen Partial Pressure and its Measurement  
       O₂ in Aqueous Biological Systems                                          | 13          | 7        | Photography                         |
| 8    | Photography - Lens Concepts  
       Exam II                                                                         | 15          | 8        | Light Measurement                   |
| 9    | Photography - Exposure, Film & Processing  
       Concepts of Light Measurement                                                 | 17          | 9        | Spectrophotometry                   |
| 10   | Spectrophotometry in Biological Research  
       Deviations from Beer’s Law                                                   | 19          | 10       | Radionuclide Fundamentals           |
| 11   | Properties of Ionizing Radiation  
       Exam III                                                                       | 20          | 11       | Radionuclide Application            |
| 12   | Radiation Safety Concepts  
       Radioactivity Measurement                                                        | 23          | 12       | Tracer Applications (problems)      |
| 13   | Isotope Dilution Concepts  
       Locating Tracers in Time and Space                                                 | 24          |          |                                     |