**Statement of Objectives and Outcomes for Subject 6.163 – Strobe Project Laboratory**

James W. Bales, Revised, 11 September 2006.

## Objectives

Strobe Project Laboratory (6.163) is a project-based laboratory subject. On completion of the subject, students should be able to:

1. Plan, execute, and document a hands-on experimental project of modest scope.
2. Work effectively as part of a small team on such a project.
3. Communicate effectively with peers and superiors through written memos, oral presentations, and visual images.
4. Create visually attractive images to communicate technical concepts.
5. State the fundamental processes behind electronic flashes, and the parameters that characterize them.

## Outcomes

On completion of the course, students should be able to:

1. (a) Define the goals of an experiment
   (b) Generate approaches to meet that goal, and select one.
   (c) Construct a detailed procedure for implementing that experimental approach in the laboratory
   (d) Collect the requisite equipment and supplies for the experiment in advance.
   (e) Conduct the experiment, recording the changes made to the procedure during the experiment.
   (f) Document the results of the experiment.

2. Extract quantitative measurements of an experiment from the high-speed imagery.

3. Work effectively in a team by accepting a fair share of the work and completing it by the agreed-upon deadline.

4. Create a standardized Project Plan for a laboratory exercise of small (150 man-hours) scope.

5. Write a standard engineering memo documenting an experiment, including procedures followed, results obtained, interpretation of those results, and specific recommendations for future work.

6. Working in a small group, prepare and present a coherent, concise, and effective oral presentation of 5-15 minutes length.

7. Take a well-exposed, well-composed, and well-lit B/W or digital photograph using either ambient light or strobe light, or both.

8. Make a well-exposed and well-composed B/W print from a photographic negative.

9. Select the appropriate high-speed-imaging technique for a specific engineering application.

10. Analyze the performance of an electronic flash using the standard model presented in class.

11. Explain the principles of operation of a high-speed video camera, and be able to set up such a camera and collected imagery of a high-speed event..

**Graded materials in the subject**

The students perform five set-piece laboratory exercises in teams of four. Students are graded on their conduct and performance during the lab period and on their individually written reports. Each report is 5% of the final grade. The team also plans and executes one "Mini-Project" during the term. They are given a general assignment (e.g., measuring velocities in an impact and its spatial extent). The team conceives of an experiment that will allow them to collect the data needed to complete the assignment one week, executes the experiment during their scheduled lab time the next week, and then turn in individually-written reports the following week.

Each team of 4 students spends two weeks performing a feasibility study for their final project (this is the Mark I version of their project). They submit a jointly written report and give a joint presentation. They are also graded on their performance in the lab. This work constitutes 15% of the final grade.

Each team of 4 students spends four weeks performing their final project. They submit a jointly written report and give a joint presentation. They are also graded on their performance in the lab. This work constitutes 35% of the final grade.

During the term, the students are assigned one homework set and one in-class quiz, each constitutes 10% of the final grade.

**Outcomes tested with graded materials**

| Outcome | Lab 1 | Lab 2 | Lab 3 | Lab 4 | Lab 5 | Practical Exercise | Mark I | Final Project | HW & Quiz |
|---|---|---|---|---|---|---|---|---|---|
| 1 a | | | | | | | X | X | |
| 1 b | | | | | | | X | X | |
| 1 c | | | | | | | X | X | |
| 1 d | | X | X | X | | | X | X | |
| 1 e | X | X | X | X | X | X | X | X | |
| 1 f | X | X | X | X | X | | X | X | |
| 2 | X | X | X | X | X | | X | X | X |
| 3 | X | X | X | X | X | | X | X | |
| 4 | X | X | X | X | X | | X | X | |
| 5 | X | X | X | X | X | | X | X | |
| 6 | | | X | | | | X | X | |
| 7 | X | X | X | X | X | X | X | X | X |
| 8 | X | X | X | X | X | X | X | X | |
| 9 | | | | | | | X | X | X |
| 10 | | | | | | | X | X | X |
| 11 | | | | X | | | X | X | X |