

BS 192:

Physics Laboratory



Physics, IIT Gandhinagar
Jan-April 2025

- ✓ The course plan is for the entire semester and concerns only physics lab, although half of the students of BS 192 will do physics lab experiments in the first half of the semester (Batch 1) and rest in the second half (Batch 2).
- ✓ Each student group (3-5 students) will perform 5 experiments.

Course Contents

Quantum Physics, Optics and Acoustics; Credits: 3

Instructors

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Lab Schedule

2:00 pm to 4:50 PM, Room: AB6/109

Section	Day of Laboratory	Report Submission
1	Tuesday	Tuesday (next week before 2PM)
2	Wednesday	Wednesday (next week before 2PM)
3	Thursday	Thursday (next week before 2PM)
4	Friday	Friday (next week before 2PM)

You need to submit a hard copy of the lab report (including the pre-lab report*) for each experiment before the start of the next experiment (as indicated in the table above).

*Please check the Lab Report section. The first part of the report (Introduction+Principle/theory+Experimental Procedure) has to be written before coming to the lab to perform the experiment.

List of Experiments

Quantum Physics

P1. The Photoelectric Effect: To calculate the value of Planck's constant

P2. The Franck-Hertz Experiment: To verify quantization of atomic energy states.

Optics

P3. Newton's Ring: To determine the radius of curvature of a lens.

Acoustics

P4. Kundt's Tube: To measure the speed of sound in air.

P5. Ultrasonic Diffraction: To find the velocity of ultrasonic waves in liquids

Experiment schedule for the first week is given below. For the following weeks, the groups will do successive experiments. For example, G1 will perform P2 experiment in the 2nd week, P3 in the 3rd week and so on. We have 2 setups for each experiment.

Experiment (Week 1)	Group
P1	G1, G7
P2	G2, G8
P3	G3, G9

P4	G4, G10
P5	G5,

Lab schedule for each section in each batch:

Batch 1:

Tue : 7 Jan, 18 Jan (Saturday)*, 21 Jan, 28 Jan, 4 Feb

Wed : 8 Jan, 15 Jan, 22 Jan, 29 Jan, 5 Feb

Thu : 9 Jan, 16 Jan, 23 Jan, 30 Jan, 6 Feb

Fri : 10 Jan, 17 Jan, 24 Jan, 31 Jan, 7 Feb

Batch 2:

Tue : 18 Feb, 25 Feb, 18 Mar, 25 Mar, 1 Apr

Wed : 19 Feb, 22 Feb (Saturday)*, 19 Mar, 26 Mar, 2 Apr

Thu : 20 Feb, 27 Feb, 20 Mar, 27 Mar, 3 Apr

Fri : 21 Feb, 28 Feb, 21 Mar, 28 Mar, 4 Apr

* Lab sessions in lieu of holidays

Grading Policy

(A) Lab conduct and report: 20 point/experiment. There will be 5 experiments. Overall weightage: 70%

(B) 1 Quiz covering 6 experiments: 30% (During scheduled exam period)

The lab conduct will include the following aspect:

1. Strictly follow the instruction manual while handling the laboratory equipment
2. Timely start and completion of the experiment
3. Active participation in the lab work

Please note the following:

(i) Anyone arriving after 2:05 pm: -1 point.

(ii) Anyone arriving after 2:15 pm: -3 point.

(iii) Anyone arriving after 2:30 pm: Will not receive any point in the lab conduct part (-5 point).

(iv) Any deviation from the safe operating procedures of the equipment will lead to negative marking [-1 point for first, -3 points for 2nd, will not be allowed to continue after 2nd].

The Lab report

Each group will submit a combined report. The contribution of each group member should be included and endorsed by all members. The details on the format of the report is given below.

A report should have 5 essential parts as detailed below. The title of the experiment and the name of all group members need to be mentioned on the first page. The first part of the report (Introduction+Principle/theory+Experimental Procedure) has to be written before coming to the lab to perform the experiment (this lab preparation will carry marks in your lab report evaluation).

1. Introduction, Principle/Theory (2 marks) *

Introducing the scientific part of the experiment. The mechanism or working principle of the apparatus or theory behind the experiment needs to be described here.

2. Experimental procedure (might contain apparatus used) (3 marks) *

The procedure for the execution of the experiment including details of the parameters/conditions that are relevant to the experiment.

3. Results and Discussion (10 marks)

Experimental data, calculation of the results shown in tables, graphs, analysis of the results.

4. Error analysis (4 marks)

Error analysis and a thorough discussion of the results including the plausible causes of errors.

5. Conclusions (1 mark)

The summary of the findings of the experiment and the scope for future work.

6. Author contributions

Include the list of students performed the experiment along with their roll no and contributions to the experiment and report. All the group members need to sign the report and confirm the contributions.

Do not copy from the lab manual or from other students. Write the report in your own language. The name of the students(s) will be reported to SSAC in case of any plagiarism found in the reports.

*** The first part of the report (Introduction+Principle/theory+Experimental Procedure) has to be written before coming to the lab to perform the experiment. As indicated, this lab preparation will carry 5 marks in your lab report evaluation. Marks will be awarded before starting the experiment.**

Lab Report & Expectations

It is expected that the report should comment on nontrivial observations and results, and make an attempt to find their cause. For instance, if the reports say, "We measured the free-fall acceleration, g , in the classroom to be 8.68 m/s^2 ", the expectation is to justify and list the possible reasons for the deviation from the standard value.

The report should not merely speculate on the sources of experimental errors. Statements like "Stray light may have caused a discrepancy in the results" need to be supported with data or some plausible mechanism.

Students are expected to appreciate the importance of error analysis and accordingly prepare their reports. The instructor will discuss these points in the first class.

Instructor notes and instrument manuals are available in the lab. Students are expected to read them thoroughly and prepare the first part of the report (Introduction+Principle/theory+Experimental Procedure) before coming to the class.

Communication & Resources

1. Communications:

All the communication related to the course is through Google Classroom.

2. Office hours:

Consult TA's and instructor if there any issues with the experiment or report writing. Clear all your doubts in the laboratory itself. Out of office hours are only by prior-appointment.

3. Books:

a). Experimental Physics: Modern Methods by R. A. Dunlap, OUP USA.

b). Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements – J. R. Taylor, University Science Books.

Course Policies

Indian Institute of Technology Gandhinagar is a community of scholars committed to developing individuals who practice personal and academic integrity. Any student participating in any form of **academic dishonesty and malpractice** will be subject to sanctions as described in the institute's policy on academic dishonesty.

Copying in lab reports will result in zero points and may face other disciplinary actions. During experiments, however, discussions among students regarding concepts and ideas behind problem-solving will not be considered as copying.

Deadlines for report submission are strictly enforced. No extension will be given unless there is a health issue, family emergency, or participating in an external academic/sports event outside the IITGN campus. In the last case, permission has to be taken in advance.

Use of **Mobile phones** is strictly not permitted during lab hours.

There will be a **buffer week** to carry out **one** experiment in case if you miss it during the allocated schedules.