Welcome to your first-year Physics subject – a spectrum of subjects designed for a range of students, from physics specialists to those for whom physics supports other areas of interest. This document aims to provide a clear outline of what students and staff in the subjects expect from each other, as well as advice on gaining as much as possible from the subjects. We hope that the hints here help you to make the most of your partnership with teaching staff to build a great foundation for your future in physics or in other science and technology studies.

Constructing your understanding of Physics starts with putting together an overall framework. You then need to fill in the gaps between parts of this framework to build your final understanding.

Parts of what you do, and what teaching staff provide, will help with the framework. Lectures fit into this category. The lecturers aim to show clearly the links between physics principles and physics in the everyday, as well as the physics relevant at nuclear and cosmological scales.

However lectures are just the start. The solid work of grappling to understand the ideas and apply them is the most substantial part of your learning. This will be achieved through reviewing lecture material, talking (even arguing!) with your colleagues in tutorials, workshops and study groups, exploring ideas hands-on in the labs and practising solving problems.

The assessment tasks you do during the semester give you feedback on your learning at various stages. This feedback varies from your week-by-week interaction with demonstrators and tutors, to the assignment and the tests that happen twice each semester. The end-of-semester exam is the final check on how deep your understanding is and how broadly you can apply that understanding to a variety of contexts.

**Putting in the time**

Students should expect to invest an average of 10 - 12 hours per week in each of their subjects. This includes hours in classes, which vary from 4 to 7 hours per week, depending on lab workshop scheduling.

Here's one way your 10 - 12 hours per week in physics could usefully be allocated. It is mapped out for someone with a tutorial on Tuesday and lab on Thursday afternoon.

<table>
<thead>
<tr>
<th>Classes</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Weekend</th>
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</thead>
<tbody>
<tr>
<td>Lecture</td>
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<td>Lecture</td>
<td>Labs: 7/semester</td>
<td>Lecture</td>
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<tr>
<td>Your time</td>
<td>0.75 hour lecture review; 0.5 hour tute prep</td>
<td>0.75 hour answering questions</td>
<td>0.75 hour lecture review; 0.5 hour lab prep</td>
<td>1.5 hours in non-lab weeks - overview activities</td>
<td>0.75 hour lecture review; 0.75 hour answering questions</td>
<td>1.5 hours overview activities</td>
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**Lectures - before and during ...**

Seek to use lectures to gain an overview of each area, guidelines to the ideas you should aim to understand and how you should be able to apply these ideas.

**Preparation - including lecture notes on the web:** Most lecturers will make at least skeleton lecture slides available in time for you to obtain a copy before the lecture. As lectures are often modified in the light of how students responded to the previous lecture, these resources normally will not be made available until two days before the lecture. Earlier provision of the notes would make this sort of responsiveness more difficult.
Scan through the notes before you arrive, and read the recommended sections of the text. Don’t worry about the detail. A broad overview will help you put the different parts of the lecture in place in your mind as it happens. Pre-reading will also familiarise you with new terms before they are first used in lectures.

**During the lecture:** Aim to listen and understand as much as possible during the lecture, with enough notes to be able to put the picture together afterwards. Your lecture notes will not be a finished document until you review them later.

- If you decide to take your own notes, make them spacious. Jot things down in point form. At times your notes may be headings, or the main ideas, diagrams and worked examples.
- If you use the skeleton lecture notes, add to them during the lecture.
- Sometimes it is useful to record what the lecturer says, rather than writes. However don’t try to record every detail of what a lecturer says, writes and does. You can add to your notes after the lecture using key words as a prompt for your thinking.
- Don’t expect to leave the lecture having understood it all. So, during the lecture highlight the parts you don’t understand, to follow up later.

**Following lectures - what comes afterwards ...**

**Before the next lecture:**

- Make sure you have come to grips with one lecture before the next one starts.
- **Follow up the asterisks in your lecture notes** - the items you have highlighted because they did not make sense to you at the time. Read the relevant section of the textbook to assist here. If the issue is still a mystery, go to the next FYLC session to ask about it, or take the question to your next tute.
- **Read your textbook and use this reading to add to your lecture notes in your own words.** Don’t just copy out some words that appear relevant. Instead, think about what would be useful extra information, or an example that illustrates the ideas. This is much more active than just highlighting as you read.
- **What were the main ideas?** Try writing one sentence describing the main points of the lecture, to check on whether you have an overview of its big ideas.

**Applying the ideas - answering questions:**

- Reviewing lecture notes, and trying to understand how the ideas fit together should happen **before** you start solving problems. Once you have done this ...
- **check your understanding** by attempting the recommended questions and problems. Learning happens when you are active. So, be sensible in using any solutions that are provided. Scanning another person’s suggested strategy is no substitute for tackling the question yourself.

**Overview activities:**

- **Write up a glossary page for a new term.** Write the term at the top of a page; then use words and/or diagrams to show:
  - the meaning of the term;
  - the situations in which the idea is relevant;
  - examples of its use;
  - its links to other ideas.
- **Draw a concept map for a section of the subject.** Take a page and draw ellipses / circles / rectangles ... to represent the important concepts. Draw lines between concepts that are strongly linked, and write a phrase/sentence/equation to describe the link between them. Compare your concept maps with other students’ versions - not to compete for the “best” map, but to learn about other ways of thinking about linking the ideas. The value in concept maps is not the finished product - it is the thinking processes involved in making them.
**Tutorials**

This is the learning environment that is closest to your school experience. You will be encouraged to work on tasks in groups and to ask questions.

Tutorials are most effective when students participate fully, being prepared to work actively in groups, discuss their ideas and take risks in identifying where they need help.

**Come prepared** with questions about concepts and problems you do not understand. Make sure you do not leave the success of your tutorial to your tutor - get involved.

**Lab workshops**

Learning hands-on in the lab is a very effective learning experience. The workshops have been designed to complement your other learning as you see physics in action and apply its ideas.

One of the most enjoyable aspects of the lab is the interaction with people - your fellow students and demonstrators will be a great resource.

Many students also find working in the lab very challenging. Observing how physics works may stretch you! Since lab classes are the longest single class you experience you may find them physically and mentally tiring. This is particularly true at the beginning of the year. You will be impressed by your increased ability to manage your learning in the lab as the year progresses.

**Being prepared** is one key to meeting the challenge of learning in the lab, and the prelab exercises are designed to help with this. It is also very helpful to have a birds’-eye view of how the exercise reinforces your learning of ideas from lectures and tutorials.

Some students find working out what to write down challenging as well. You are being trained as a scientist here. Record what you do as you go. Your aim is to produce a useful record of what you did, observed and concluded, not a carefully crafted report.

**Demonstrating your understanding and feedback**

You will be given the opportunity to demonstrate your understanding of physics in an assignment and two tests during each semester, in weekly lab workshops and the final exam.

The tests are intended to give you feedback, while contributing a small amount to assessment.

The test and exam assessment aims to enable you to demonstrate your understanding by:

- describing situations in the sciences where physics is important
- using physics principles to explain what occurs in these contexts
- applying physics principles quantitatively to a variety of contexts

There are other sources of feedback: interactions with tutors and demonstrators as they answer your questions, and ask you further questions to follow-up; Mastering Physics solutions to recommended questions; feedback on your lab records all help you to know if you are moving in the right direction.

**Outcomes**

Here are the objectives we have in teaching students in the first-year Physics subjects. We aim to enable students completing this subject to:

- explain their understanding of physics principles and applications lucidly, both in writing and orally;
- acquire and interpret experimental data and design experimental investigations.
- participate as an effective member of a group in tutorial discussions, laboratory and study groups;
- think independently and analytically, and direct their own learning;
- manage time effectively in order to be prepared for regular practical and tutorial classes, tests, assignment and the examination.