

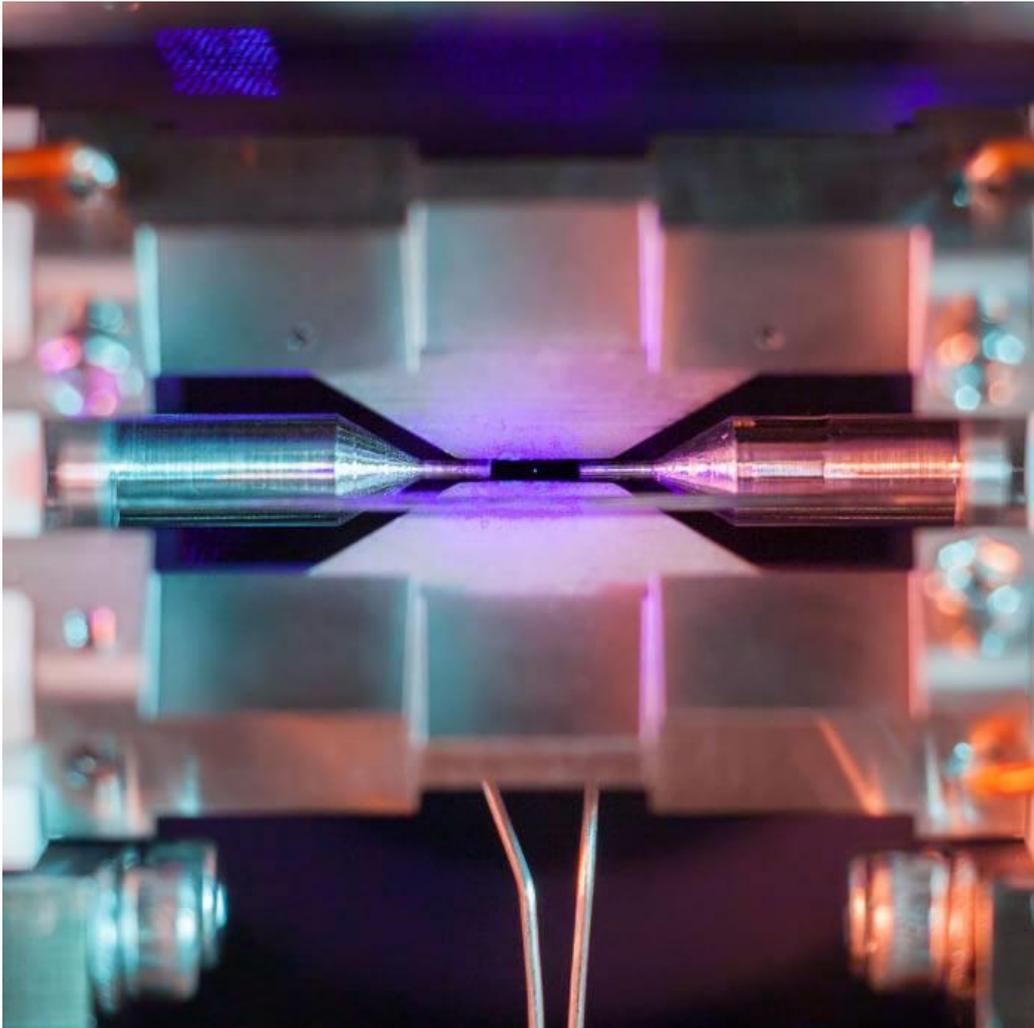
# IB PHYSICS

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*'All science is either physics or stamp collecting'*

*/Ernest Rutheford „Rutherford at Manchester” (1962)/*

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**„Single atom in an ion trap”, David Nadlinger - University of Oxford, 2018**

[<https://www.epsrc.ac.uk/newsevents/news/single-trapped-atom-captures-science-photographycompetitions-top-prize/>]

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## What is the course about?

"Give me a point of support and I will move the earth!" said Archimedes after his invention of the lever. These words perfectly reflect the spirit of physics: a science that gives a point of support to understand the world ...because physics is everywhere and spin this world around!

Physics is a science connected with many other natural sciences such as: physical chemistry, astrophysics, geophysics and biophysics. And yet different than all ....

The IB Physics course at BISC is primarily designed to give students a more nuanced understanding of structure of the matter and the laws which rules this matter. Both SL and HL students study the core od physics to their Paper 1 and Paper 2 exam:

- Measurements
- Kinematics (basics of motion, laws of newton's dynamics, circular motion)
- Thermal physics (the concept of ideal gas, change in the state of matter, rules of thermodynamics)
- Gravity field (power of attraction)
- Waves and simple harmonic motion (because everything is a wave if we look closely)
- Electricity and magnetism (or "let there be light!" from a scientific point of view)
- Nuclear physics (how the world is built, which is its smallest indivisible part, nuclear interactions and their impact on human life and health,)
- Different sources of energy (renewable and non-renewable)

Students can also choose an optional module from one of the following:

- Relativity
- Engineering physics
- Imaging
- Astrophysics

## How is the course structured?

In the first term of the first year, both SL and HL students will explore the basics concepts of Physics (measurements, kinematics, thermal physics, electricity and magnetism). The second term is focused on simple harmonic motion (SHM) and waves. During the discovering each sections of physics, students perform both open-questions tasks (covered by Paper 1) and so called open questions (covered by Paper 2). Each section is followed by a repetition of the material for its fixation.

The 2nd term of the first year is also the beginning of planning the Internal Assesement (IA), which should take into account the individual needs and interests of students).

In the second year, both SL and HL students will know about nucelar physics in details. HL students also study the third and final module for Paper 3 (we are doing our best to choose the option before the end of the first year). After that the mock examinations are proceed. Remaining time will be spent on revision and study leave for the IB examination.

## What distinguishes this course from others?

What makes physics so unique in comparison to other sciences is experiments. Research shows that practical knowledge is absorbed much faster (and longer lasting!) than theory. To touch is to understand. Therefore, as part of the course, we strive to make the theory richly illustrated by experience.

For this purpose, we give our laboratories in the hands of students. Under the watchful eye of a teacher and compliance with strict safety regulations we allow students not only to measure, weigh and set things in motion: we let them by themselves know the world around them and give the tools to know how this world to describe.

What distinguishes physics is the fact that in addition to the passing the knowledge and teaching how to count, we also teach how to extract conclusions from the observations. Our main goal is to rekindle passion in students, and for two years during IB course fuel the flame in their scientific hearts.

## How is the course assessed?

Each section will conclude with a test for that topic.

## Are there any requirements?

Physics is an exact science and as such requires analytical skills. A student joining the course should have the ability to think critically, but above all, the hunger for knowledge and the willingness to understand the world. The student should also understand that he has a hard and systematic job and a lot of learning, but also that the effort will pay off.

## What materials will I need?

Apart from the curiosity and a strong willingness to learn something more, you will not need any additional materials for the course. They will be provided by the Teacher.

## What career paths are open to me?

Physics next to mathematics is a basic engineering science, and knowing its secrets opens up a huge potential in career planning: in construction, architecture, astronomy, aeronautics, banking, computer science or machine building (to name a few). Physics underlies almost all engineering professions.

## Where can I find more information about the course?

Please download the Physics subject guide for more information. Please also feel free to email the Physics Teacher at [jsw@agh.edu.pl](mailto:jsw@agh.edu.pl)

## What is the relationship between TOK and Physics?

Surely, the relationship between TOK and physics is not as obvious as in the case of social sciences. It turns out, however, that this relationship is very strong. The physics course helps to put up many interesting and sometimes controversial questions, such as the responsibility of scientists for the created world. An example may be the sentence given by R. Oppenheimer regarded as the "father of nuclear bomb", just after the first trial explosion: "Now I am Death, the destroyer of the worlds". Does the war and the will to defeat the enemy, justify everything in science? During the second year of the physics course, we discuss the breakdown in Chernobyl and the catastrophe in Fukushima. This allows students to reflect on the safety of nuclear energy. Already in the first year, when we get to know the revolutionary discoveries of various scientists ( their points of view and inventions that changed the world and way of thinking), students can deliberate about what is the role of the scientist in the modern world as the one that changes reality. All these considerations can be closed in one short but fundamental question: are we allowed to set the limits for science? Searching for answer for that question is what binds TOK and physics.

## What is the relationship between CAS and Physics?

The relationship between CAS and physics is easy to find in areas in which physics shows its social aspect. The most obvious example seems to be the nuclear energy and the aspects of nuclear safety and the storage of radioactive waste.

During the physics lessons students are encouraged to express their own opinions, in this topic, for example by participating in a class discussion on renewable and non-renewable energy sources. Students have a chance to think about how they would solve these problems (creativity), suggest some changes (activity) and try to put them into practice (service).

## What is the relationship between EE and Physics?

Physics is simply created to develop it as part of extended essay. As a science based on experience, inference and independent thinking, further unlimited possibilities in describing and developing the passion of students. Each student at some stage of learning knows which part of physics he is most interested in, and on the part of the teacher is strongly encouraged to broaden their individual interests. EE is the perfect opportunity for this.

## Recommended reading

Due to the huge range of physics, any additional literature will be given after the choice of the course. In our beliefs literature should be adapted not only to the section of physics being processed at the time but also to the personal interests and experiences of each student. Previous teaching experience shows that some students are strongly interested in nuclear physics (this is probably the favorite part of physics for students), while others want to know more about application physics in construction. One thing is sure: for every student wanting to broaden their knowledge, we will find something interesting as part of additional literature.