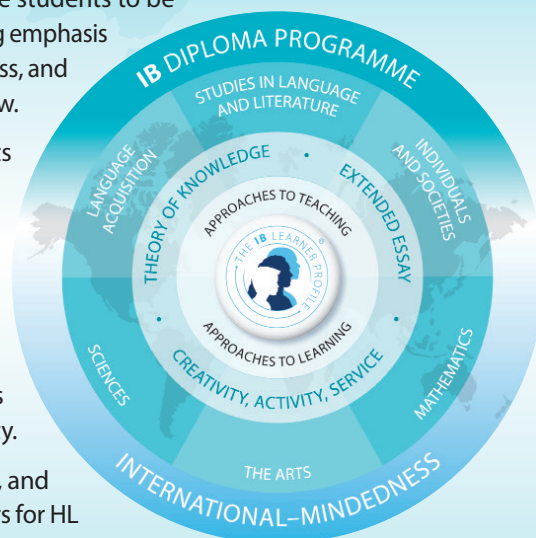


The Diploma Programme (DP) is a rigorous pre-university course of study designed for students in the 16 to 19 age range. It is a broad-based two-year course that aims to encourage students to be knowledgeable and inquiring, but also caring and compassionate. There is a strong emphasis on encouraging students to develop intercultural understanding, open-mindedness, and the attitudes necessary for them to respect and evaluate a range of points of view.

The course is presented as six academic areas enclosing a central core. Students study two modern languages (or a modern language and a classical language), a humanities or social science subject, an experimental science, mathematics and one of the creative arts. Instead of an arts subject, students can choose two subjects from another area. It is this comprehensive range of subjects that makes the Diploma Programme a demanding course of study designed to prepare students effectively for university entrance. In each of the academic areas students have flexibility in making their choices, which means they can choose subjects that particularly interest them and that they may wish to study further at university.

Normally, three subjects (and not more than four) are taken at higher level (HL), and the others are taken at standard level (SL). The IB recommends 240 teaching hours for HL subjects and 150 hours for SL. Subjects at HL are studied in greater depth and breadth than at SL. In addition, three core elements—the extended essay, theory of knowledge and creativity, activity, service—are compulsory and central to the philosophy of the programme.



## I. Course description and aims

As one of the three natural sciences in the IB Diploma Programme, physics is concerned with an attempt to understand the natural world; from determining the nature of the atom to finding patterns in the structure of the universe. It is the search for answers from how the universe exploded into life to the nature of time itself. Observations are essential to the very core of the subject. Models are developed to try to understand observations, and these themselves can become theories that attempt to explain the observations. Besides leading to a better understanding of the natural world, physics gives us the ability to alter our environments.

DP physics enables students to constructively engage with topical scientific issues. Students examine scientific knowledge claims in a real-world context, fostering interest and curiosity. By exploring the subject, they develop understandings, skills and techniques which can be applied across their studies and beyond.

Integral to the student experience of the DP physics course is the learning that takes place through scientific inquiry both in the classroom and the laboratory.

Through the overarching theme of the nature of science, the course aims to enable students to:

1. develop conceptual understanding that allows connections to be made between different areas of the subject, and to other DP sciences subjects
2. acquire and apply a body of knowledge, methods, tools and techniques that characterize science
3. develop the ability to analyse, evaluate and synthesize scientific information and claims
4. develop the ability to approach unfamiliar situations with creativity and resilience
5. design and model solutions to local and global problems in a scientific context
6. develop an appreciation of the possibilities and limitations of science
7. develop technology skills in a scientific context

8. develop the ability to communicate and collaborate effectively
9. develop awareness of the ethical, environmental, economic, cultural and social impact of science.

## II. Curriculum model overview

The DP physics course promotes concept-based teaching and learning to foster critical thinking.

The DP physics course is built on:

- approaches to learning
- nature of science
- skills in the study of physics.

These three pillars support a broad and balanced experimental programme. As students progress through the course, they become familiar with traditional experimentation techniques, as well as the application of technology. These opportunities help them to develop their investigative skills and evaluate the impact of error and uncertainty in scientific inquiry. The scientific investigation then places a specific emphasis on inquiry-based skills and the formal communication of scientific knowledge. Finally, the collaborative sciences project extends the development of scientific communication in a collaborative and interdisciplinary context, allowing students to work together beyond the confines of physics.

Syllabus component	Recommended teaching hours	
	SL	HL
<b>Syllabus content</b>	<b>110</b>	<b>180</b>
<b>A Space, time and motion</b>	27	42
A.1 Kinematics •		
A.2 Forces and momentum •		
A.3 Work, energy and power •		
A.4 Rigid body mechanics •••		
A.5 Galilean and special relativity •••		
<b>B. The particulate nature of matter</b>	24	32
B.1 Thermal energy transfers •		
B.2 Greenhouse effect •		
B.3 Gas laws •		
B.4 Thermodynamics •••		
B.5 Current and circuits •		
<b>C. Wave behaviour</b>	17	29
C.1 Simple harmonic motion ••		
C.2 Wave model •		
C.3 Wave phenomena ••		
C.4 Standing waves and resonance •		
C.5 Doppler effect ••		
<b>D. Fields</b>	19	38
D.1 Gravitational fields ••		
D.2 Electric and magnetic fields ••		
D.3 Motion in electromagnetic fields •		
D.4 Induction •••		

<b>E. Nuclear and quantum physics</b>	23	39
E.1 Structure of the atom ••		
E.2 Quantum physics •••		
E.3 Radioactive decay ••		
E.4 Fission •		
E.5 Fusion and stars •		
<b>Experimental programme</b>	<b>40</b>	<b>60</b>
Practical work	20	40
Collaborative sciences project	10	10
Scientific investigation	10	10

Key to table:

- Topics with content that should be taught to all students
- Topics with content that should be taught to all students plus additional HL content
- Topics with content that should only be taught to HL students

## Skills in the study of physics

The skills and techniques students must experience through the course are encompassed within the tools. These support the application and development of the inquiry process in the delivery of the physics course.

### Tools

- Experimental techniques
- Technology
- Mathematics

### Inquiry process

- Exploring and designing
- Collecting and processing data
- Concluding and evaluating

Teachers are encouraged to provide opportunities for students to encounter and practise the skills throughout the programme. Rather than being taught as stand-alone topics, these skills should be integrated into the teaching of the syllabus when they are relevant to the syllabus topics being covered.

## III. Assessment model

There are four assessment objectives for the DP physics course. Having followed the physics course, students are expected to demonstrate the following assessment objectives.

### Assessment objective 1

Demonstrate knowledge of:

- terminology, facts and concepts
- skills, techniques and methodologies.

## Assessment objective 2

Understand and apply knowledge of:

- terminology and concepts
- skills, techniques and methodologies.

## Assessment objective 3

Analyse, evaluate, and synthesize:

- experimental procedures
- primary and secondary data
- trends, patterns and predictions.

## Assessment objective 4

Demonstrate the application of skills necessary to carry out insightful and ethical investigations.

## Assessment at a glance

Type of assessment	Format of assessment	Time (hours)		Weighting of final grade
		SL	HL	
<b>External</b>		<b>3</b>	<b>4.5</b>	<b>80</b>
Paper 1	Paper 1A: Multiple-choice questions Paper 1B: Data-based questions	1.5	2	36
Paper 2	Short-answer and extended-response questions	1.5	2.5	44
<b>Internal</b>		<b>10</b>		<b>20</b>
Scientific investigation	The scientific investigation is an open-ended task in which the student gathers and analyses data in order to answer their own formulated research question. The outcome of the scientific investigation will be assessed through the form of a written report. The maximum overall word count for the report is 3,000 words.	10		20

**About the IB:** For over 50 years, the IB has built a reputation for high-quality, challenging programmes of education that develop internationally minded young people who are well prepared for the challenges of life in the 21st century and are able to contribute to creating a better, more peaceful world.

For further information on the IB Diploma Programme, visit: [www.ibo.org/en/dp](http://www.ibo.org/en/dp).

Complete subject guides can be accessed through the programme resource centre or purchased through the IB store: <https://www.follettibstore.com>.

For more on how the DP prepares students for success at university, visit: [www.ibo.org/en/university-admission](http://www.ibo.org/en/university-admission).