



XV. GIMNAZIJA

International Baccalaureate Department
Diploma Programme

PHYSICS

Course Outline | SL and HL

Programme	IB Diploma Programme
Subject / group	Physics / Sciences
Levels	Standard Level (SL) and Higher Level (HL)
Applicable from	Teaching from 2023; first assessment 2025

Academic year 2026/2027

Prepared for publication on the school website by IB DP Physics teachers Marko Movre and Miha Španić.

1. What is the course about?

Physics seeks to explain the natural world through observation, measurement, models, theories and mathematical relationships. The course ranges from the behaviour of matter and energy at the smallest scales to motion, fields, waves, stars and the wider universe. Students learn to connect fundamental principles with technology, everyday experience and scientific issues of local and global importance.

Inquiry is integral to the course. Students pose questions, design and carry out investigations, use simulations and modelling, process primary and secondary data, evaluate uncertainty and communicate evidence-based conclusions.

Physics course teaches about the nature of science: students become well aware of necessity of observation, measurement, building theories to explain phenomena and performing experiments to verify them.

Physics develops many skills: critical thinking, capacity of asking questions, debating using arguments, as well as planning and creativity in solving experimental or theoretical problems.

Conceptual structure

The five organizing themes are explored through three recurring concepts: forces, energy and particles. This supports connections across topics rather than treating content as isolated chapters.

2. Course implementation

Physics is taught at standard level (SL) or high level (HL) in the mixed class over two years.

Level	Recommended hours	Syllabus content	Experimental programme
SL	150	110	40: practical work 20; collaborative sciences project 10; scientific investigation 10
HL	240	180	60: practical work 40; collaborative sciences project 10; scientific investigation 10

DP Year 1: The school offers 5 lessons per week for all students.

DP Year 2: The school offers 5+1 lessons per week for HL students and 3 lessons per week (on average) for SL students.

3. Aims

- motivate students to engage in observation and exploration of natural phenomena
- develop conceptual understanding and make connections within physics and across the DP sciences
- acquire and apply scientific knowledge, methods, tools and techniques
- analyse, evaluate and synthesize scientific information and claims
- approach unfamiliar situations with creativity and resilience
- design and model solutions to local and global problems in a scientific context
- appreciate both the possibilities and the limitations of science
- develop effective technology skills in scientific contexts
- communicate and collaborate effectively
- recognize ethical, environmental, economic, cultural and social impacts of science

4. Assessment objectives

Students should be able to meet following objectives:

AO1 – Knowledge and understanding [accounts for 40 %]

- Demonstrate knowledge of terminology, facts, concepts, skills, techniques and methodologies:

- i) Describe phenomena, identify and define physical variables
- ii) State basic principles or explain concepts
- iii) State relations between variables
- iv) Apply scientific knowledge to solve problems (Unit test)

AO2 – Engagement [accounts for 5 %]

- Understand and apply terminology, facts, concepts, skills, techniques and methodologies:

- i) Engage in class discussions
- ii) State basic principles or explain concepts
- iii) Apply scientific knowledge to solve problems and propose answers to class or QUIZ questions

AO3 – Practical investigation [accounts for 20 %]

- Apply the skills required to carry out insightful and ethical investigations. Analyse, evaluate and synthesize experimental procedures, primary and secondary data, trends, patterns and predictions:

- i) Identify physical variables in observed phenomenon
- ii) State relevant and focused research question
- iii) Plan the method of investigation
- iv) Apply scientific method and techniques
- v) Analyse the data
- vi) Evaluate results
- vii) Present results using appropriate terminology in written lab reports

AO4 – Written examination (Semester test, MOCK at end DP Year 1) [accounts for 35 %]

- i) Demonstrate sound knowledge of basic principles and concepts
- ii) Solve numerical and conceptual problems
- iii) Apply data analysis skills

Maximum level of achievement/ grade for each criterion is 7.

School Grade Boundaries

Excellent	7	90 %
Very Good	6	80 %
Good	5	65 %
Satisfactory	4	50 %
Mediocre	3	40 %
Poor	2	30 %
Very Poor	1	< 30 %

Final school grades are derived using a formula that combines the average grades across all criteria and their corresponding weightings.

$$\text{Final school grade} = \text{AO1} \times 0,4 + \text{AO2} \times 0,05 + \text{AO3} \times 0,2 + \text{AO4} \times 0,35$$

5. Syllabus overview (over 2 years)

Theme	Topics	SL hours	HL hours
A. Space, time and motion (DP Year 1)	A.1 Kinematics; A.2 Forces and momentum; A.3 Work, energy and power; A.4 Rigid body mechanics (HL only DP Year 2); A.5 Galilean and special relativity (HL only DP Year 2)	27	42
B. Particulate nature of matter (DP Year 1)	B.1 Thermal energy transfers; B.2 Greenhouse effect; B.3 Gas laws; B.4 Thermodynamics (SL plus additional HL); B.5 Current and circuits	24	32
C. Wave behaviour (DP Year 1)	C.1 Simple harmonic motion (SL plus additional HL); C.2 Wave model; C.3 Wave phenomena (SL plus additional HL); C.4 Standing waves and resonance; C.5 Doppler effect (SL plus additional HL)	17	29
D. Fields (DP Year 2)	D.1 Gravitational fields (SL plus additional HL); D.2 Electric and magnetic fields (SL plus additional HL); D.3 Motion in electromagnetic fields; D.4 Induction (SL plus additional HL)	19	38
E. Nuclear and quantum physics (DP Year 2)	E.1 Structure of the atom (SL plus additional HL); E.2 Quantum physics (SL plus additional HL); E.3 Radioactive decay (SL plus additional HL); E.4 Fission; E.5 Fusion and stars	23	39

The current course has no optional topic and no Paper 3. Content previously organized as an option or separate older units has been integrated, revised or removed in accordance with the first-assessment-2025 syllabus.

6. Skills in the study of physics

Skills are integrated into teaching rather than taught as a separate block. Students experience:

Tools	Inquiry process	Typical evidence of learning
Experimental techniques; technology; mathematics	Exploring and designing; collecting and processing data; concluding and evaluating	Lab notebooks, practical reports, data-based tasks, models, presentations, tests and reflective evaluation

7. Teaching and learning

Teaching is inquiry-based, conceptually focused, contextualized, collaborative, differentiated and informed by assessment. Learning activities deliberately develop thinking, communication, social, self-management and research skills. Students use mathematics, technology and scientific conventions to construct and critique models, solve problems and communicate findings.

8. Experimental programme

- Practical work progresses from structured experimental activities during lessons to open inquiry and may include hands-on experiments, databases, simulations and modelling.
- The collaborative sciences project is an interdisciplinary, collaborative experience addressing a real-world problem. It is allocated 10 hours at both levels and is not itself an assessment component.
- The scientific investigation is an individual, open-ended investigation (Internal assessment; DP Year 2) in which the student formulates a research question, gathers and analyses data, and submits a written report of no more than 3,000 words. It contributes 20 % of the final IB grade.
- All work must comply with safety, ethical and academic integrity expectations. Sources, data, images, code and ideas from others must be acknowledged.

9. Assessment model (IB Finals; DP Year 2)

Component	Format	SL time	HL time	Weight
Paper 1	1A multiple-choice; 1B data-based questions	1 h 30	2 h	36 %
Paper 2	Short-answer and extended-response questions	1 h 30	2 h 30	44 %
Scientific investigation	Individual written report, maximum 3,000 words	10 h	10 h	20 %

External assessment accounts for 80 % and the internally assessed, externally moderated scientific investigation (IA) for 20 %. School report grades are determined under the school assessment policy and are not fixed IB examination grade boundaries. Boundaries for IB examinations may vary by session and must not be presented as permanent percentages.

10. Links to the DP core and learner profile

- Theory of knowledge: evaluating evidence, models, assumptions, uncertainty, explanation and the status of scientific knowledge claims.
- Extended essay: opportunities for sustained independent research in physics, using appropriate methodology, analysis and academic writing.
- CAS: authentic connections may arise through science communication, sustainability, outreach, engineering or service projects, provided CAS requirements are met independently.
- Learner profile: inquiry, knowledge, thinking, communication, principled conduct, open-mindedness, caring, courage in unfamiliar problems, balance and reflection are embedded in learning and experimental practice.

11. Prior learning and progression

Successful participation benefits from secure algebra, graphing, proportional reasoning, trigonometry, scientific notation, units and data handling, together with willingness to work experimentally. [Linear, quadratic, and exponential/logarithmic functions with their graphs. Basic algebra, solving linear and quadratic equations. Basic trigonometric and geometric skills. Fundamental spreadsheet and word processing skills.] Students considering HL or physics-dependent university pathways should consult the subject teacher and university entry requirements.

12. Sources and publication note

- International Baccalaureate Organization. Physics guide. First assessment 2025. Published February 2023.
- International Baccalaureate Organization. DP Sciences: Physics subject brief. First assessment 2025.
- International Baccalaureate Organization. “Physics in the DP”, updated 6 March 2026.
- International Baccalaureate Organization. Programme standards and practices (2020).
- XV. gimnazija. Physics Course Description 2019/2020 and Curriculum Overview 2019/2020, used as structural school references.

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