Diploma Programme subject outline—Group 4: sciences					
School name	Spojená škola, Pankúchova 6. 851 04 Bratislava			**School code**	061749
Name of the DP subject *(indicate language)*	Physics				
Level *(indicate with X)*	Higher X	Standard completed in two years X	Standard completed in one year *		
Name of the teacher who completed this outline	Zuzana Butler	**Date of IB training**		June 17-19, 2022	
Date when outline was completed	20 May 2022	**Name of workshop** *(indicate name of subject and workshop category)*		DP Physics Cat 1 - virtual	

* All Diploma Programme courses are designed as two-year learning experiences. However, up to two standard level subjects, excluding languages ab initio and pilot subjects, can be completed in one year, according to conditions established in the *Handbook of procedures for the Diploma Programme*.

1. **Course outline**

– Use the following table to organize the topics to be taught in the course. If you need to include topics that cover other requirements you have to teach (for example, national syllabus), make sure that you do so in an integrated way, but also differentiate them using italics. Add as many rows as you need.

– This document should not be a day-by-day accounting of each unit. It is an outline showing how you will distribute the topics and the time to ensure that students are prepared to comply with the requirements of the subject.

– This outline should show how you will develop the teaching of the subject. It should reflect the individual nature of the course in your classroom and should not just be a “copy and paste” from the subject guide.

– If you will teach both higher and standard level, make sure that this is clearly identified in your outline.

	Topic/unit (as identified in the IB subject guide) *State the topics/units in the order you are planning to teach them.*	Contents	Allocated time One class is 45 minutes. In one week there are 5 classes.	Assessment instruments to be used	Resources *List the main resources to be used, including information technology if applicable.*
Year 1	1) Measurement and Uncertainities	1.1 Measuremenmt in Physics 1.2 Uncertainities and errors 1.3 Vectors and scalars	September	• Test yourself questions of coursebook on each subtopic to be completed • Exam style question of coursebook, and past exam questions on each topic to be completed. • Homework to be monitored via Toddle (Edupage). • All lab work to be assessed according to IA criteria. • As a formative assessment instrument, At the end of each topic, end-of topic quizzes are given • As a summative assessment instrument, each semester students write two mock exams including past IB exam questions • All assessment instruments applied throughout the year is used for student's learning not to rank them. • Internal investigation as an assessment tool	• IBDP Physics course books and revision books published by different publishers, students have one and others are available in school library • Inthiking Physics resource is used by teachers to see different perspectives and matarials are shared with students. • IB DP Online question bank is used for producing quizes, mock exams and homework. • Simulations (Phet, etc),Data logging, databases, and spreadsheets are in use in class • Vernier software and hardware are used for experimental work (such as Graphical Analysis Software, necessary probes).
	2) Mechanics	2.1 Motion 2.2 Forces 2.3 Work, energy, and power 2.4 Momentum and impulse	September- October		
	6) Circular Motion and Gravitation	6.1 Circular Motion 6.2. The Law of Gravitation	November		
	3) Thermal Physics	3.1 Thermal concepts 3.2 Modelling a gas	December		
	4) Waves	4.1 Oscillation 4.2 Travelling waves 4.3 Wave characteristics 4.4 Wave Behaviours 4.5 Standing waves	December-February		
	9) Wave Phenomena (HL)	9.1 Simple harmonic motion (HL) 9.2 Single slit diffraction (HL) 9.3 Interference (HL) 9.4 Resolution (HL) 9.5 The doppler effect (HL)	March-April		
	5) Electricty and Magnetism	5.1 Electric field 5.2 Heating effect of electric current 5.3 Electric cells 5.4 Magnetic field	May-June		

Year 2	11) Electromagmetic Induction (HL)	11.1 Electromagnetic induction (HL) 11.2 Transmission of Power (HL) 11.3 Capacitance (HL)	September-October	• Test yourself questions of coursebook on each subtopic to be completed • Exam style question of coursebook, and past exam questions on each topic to be completed. • Homework to be monitored via Toddle. • All lab work to be assessed according to IA criteria. • As a formative assessment instrument, At the end of each topic, end-of topic quizzes are given • As a summative assessment instrument, each semester students write two mock exams including past IB exam question. • All assessment instruments applied throughout the year is used for student's learning not to rank them.	• IBDP Physics course books published by different publishers, students have one and others are available in school library • Inthiking Physics resource is used by teachers to see different perspecrives and matarials are shared with students. • IB DP Online question bank is used for producing quizes, mock exams and homework. • Simulations (Phet, etc),Data logging, databases, and spreadsheets are in use in class • Vernier software and hardware are used for experimental work (such as Graphical Analysis Software, necessary probes).
	8) Energy Production	8.1 Energy sources 8.2 Thermal energy transfer	October		
	10) Fields (HL)	10.1 Decsribing fields (HL) 10.2 Fields at work (HL)	November		
	Option C) Imaging	C.1 Introduction to imaging C.2 Imaging ınstruments C.3 Fibre optics C.4 Medical imaging (HL)	December- January		
	7) Atomic, Nuclear, and Particle Physics	7.1 Discrete energy and radioactivity 7.2 Nuclear reactions 7.3 The structure of matter	February-March		
	12) Quantum and Nuclear Physics (HL)	12.1 The interaction of matter with radiation (HL) 12.2 Nuclear physics (HL)	March-April		

2. **The group 4 project**

As the IB guides say, “The group 4 project is a collaborative activity where students from different group 4 subjects work together on a scientific or technological topic, allowing for concepts and perceptions from across the disciplines to be shared in line with aim 10—that is, to ‘encourage an understanding of the relationships between scientific disciplines and the overarching nature of the scientific method.’” Describe how you will organize this activity. Indicate the timeline and subjects involved, if applicable.

Students at Spojená škola work collaboratively during G4 Projects at the end of the first year. First of all, students are divided into groups by science teachers, each group has students from each subject (Chemistry, Physics, and Biology). Students are informed about the rationale and requirements of G4 (rather than product, process and collaboration are important).
2 Saturday (from 08 : 00-12: 30) is dedicated to complete G4. A general theme is announced to students, each group study on different topics or research questions. Each subject student elaborates on their findings and makes presentation.
During their research process, students benefit from various reliable sources. They are encouraged to become active listeners, engaging in conversations and discussions which are indispensible features of group working.
Students are encouraged to develop projects which focus on a better and greener environment. And also they are expected to consider effects and damages of technology and science on earth.

3. **IB practical work and the internal assessment requirement to be completed during the course**

As you know, students should undergo practical work related to the syllabus.

- Physics, chemistry and biology: 40 hours (at standard level) or 60 hours (at higher level)
- Computer science: 40 hours (at standard level) or 40 hours (at higher level)
- Design technology: 60 hours (at standard level) or 96 hours (at higher level)
- Sport, exercise and health science: 40 hours (at standard level) or 60 hours (at higher level)

Use the table below to indicate the name of the experiment you would propose for the different topics in the syllabus.

An example is given. Add as many rows as necessary.

Name of the topic	Experiment	Any ICT used? *Remember you must use all five within your programme.*
Measurement	Error in Measurement	Data logging, Spreadsheet
Measurement	Vector addition and subtraction on the internet (simulation)	Computer model/simulation
Mechanics	Determaning the acceleration of free fall experimentally	Data logging, Graph plotting software
Mechanics	Uniform acceleration from Galileo's inclined plane	Data logging, Graph plotting software
Mechanics	Speed of bullet from video analysis	Computer model/simulation
Mechanics	Computer analysis of projectile motion	Computer model/simulation

Mechanics	Atwood machine with smart pulleys	Data logging, Graph plotting software
Mechanics	Newton's second law with constant system mass with vernier dynamic system	Data logging, Graph plotting software
Mechanics	Terminal velocity of paper beaking cups	Data logging, Graph plotting software
Mechanics	Ballistic pendulum	Data logging, Graph plotting software
Mechanics	Inelastic collision (trolley, wall and motion detector)	Data logging, Graph plotting software
Circular motion	Investigating period of bob which is doing uniform circular motion	Data logging, Spreadsheet
Thermal Physics	Applying the calarimetric techniques of specific heat capacity and/or specific latent heat experimentally	Data logging, Spreadsheet
Thermal Physics	Investigating gas laws experimentally	Data logging, Graph plotting software
Waves	Refractive index (light and plastic semicircle)	Data logging, Spreadsheet
Waves	Surface water waves in a ripple tank	Data logging, Spreadsheet
Waves	Standing wave speed in elastic band	Data logging, Graph plotting software
Waves	Measuring speed of sound in air by echo method	Data logging, Spreadsheet
Waves	Two source interference by using water waves	Data logging, Spreadsheet
Waves	Measuring the space between pits of CD or DVD (two sourse interference)	Data logging, Spreadsheet
Waves	Investigating Malu's Law by using 3D glasses and vernier light sensor	Data logging, Graph plotting software
Wave phenomena	Single slit diffraction	Computer model/simulation

Wave phenomena	Investigating Young Double Slit experiment by using Vernier Interfence set-up	Data logging, Grapgh plotting software
Wave phenomena	Doppler Effect simulation Lab	Computer model/simulation
Wave phenomena	Resolving power of human eye	Data logging, Spreadsheet
Electricty and Magnetism	Coulomb's Law from video anaylyis	Computer model/simulation
Electricty and Magnetism	Electric fields and equapotentials	Computer model/simulation, Data logging, Spreadsheet
Electricty and Magnetism	Investigating the factors effects the resistance	Data logging, Spreadsheet
Electricty and Magnetism	Investigating Ohm's Law	Data logging, Spreadsheet
Electricty and Magnetism	Determining internal resistance of a cell	Data logging, Spreadsheet
Electromagmetic Induction	Investigating electromagnet	Data logging, Spreadsheet
Electromagmetic Induction	Investigating DC motor and AC generator	Data logging, Spreadsheet
Electromagmetic Induction (HL)	Investigating a diode bridgerectification circuit experimentally	Data logging, Spreadshee
Electromagmetic Induction (HL)	Investigating factors effect transmission on transformer	Data logging, Spreadsheet
Energy Production	Energy Density (internet research investigation)	Database, Graph plotting software
Imaging	Forming images by using thin lenses	
Imaging	Calculating critical angle of perspex box experimentally	
Atomic, Nuclear, and Particle Physics	Investigating the half-life of a decaying radioactive sample	Graph plotting software, computer simulation
Atomic, Nuclear, and Particle Physics	Spectrum analysis of of various gases (internet research investigation)	Computer model/simulation ,Database, Grapgh plotting software

Quantum and Nuclear Physics	Invertigating factors effect photoelectric current (simulation experiment)	Computer model/simulation ,Database, Grapgh plotting software

4. **Laboratory facilities**

Describe the laboratory and indicate whether it is presently equipped to facilitate the practical work that you have indicated in the chart above. If it is not, indicate the timeline to achieve this objective and describe the safety measures that are applicable.

Physics Laboratory is equipped with all necessary equipment to run DP Physics course. We are using mainly Vernier equipment for data logging which are ordered by department and purchased by foundation. Except radioactive materials, all investigation listed above could be done by students under supervision of a teacher.

5. **Other resources**

Indicate what other resources the school has to support the implementation of the subject and what plans there are to improve them, if needed.

There are a variety of Physics resources available for student use, both in the library and in the Science department, which include online resources such as Turnitin, IB online question bank. The School Library and the Science Department has a varied and very well-stocked range of DP Physics and other textbooks, DVDs which include television documentaries on current scientific issues and topic specific educational programs. The school plans to buy subscriptions to a variety of science journals including New Scientist and Physics Education. Students are encouraged to use a range of course books in the library but an IB Diploma specific course book is purchased – one per student at the start of the course: Physics for the IB Diploma by Hodder Education. The School library and the Science Department has a range of additional Physics resources suitable for students at this level, and is in the process of reassessing these and extending the collection. These can act as extension material, university preparation and research material suitable for students to prepare their Extended Essays, and IA's. The Science department has a list of websites which will be used to support learning. Examples of websites to be used include the Inthinking, Phet, and Physics Classroom .

6. **Links to TOK**

You are expected to explore links between the topics of your subject and TOK. As an example of how you would do this, choose one topic from your course outline that would allow your students to make links with TOK. Describe how you would plan the lesson.

Topic	Link with TOK (including description of lesson plan)
Describing the effects of the Earth's atmosphere on the mean surface temperature Syllabus link 8.2	Having toaught that the absorption of infrared radiation by greenhouse gases described in terms of the molecular energy levels and the subsequent emission of radiation in all directions, and the greenhouse gases(CH_4, H_2O, CO_2 and N_2O) are taught to be considered as that they haveh both natural and man-made origins. Then students are motivated to have a debate about global warming illustrates the difficulties that arise when scientists cannot always agree on the interpretation of the data, as the solution would involve large-scale action through international government cooperation. Students are also asked to consered several questions as ; when scientists disagree, how do we decide between competing theories?

7. **Approaches to learning**

Every IB course should contribute to the development of students' approaches to learning skills. As an example of how you would do this, choose one topic from your outline that would allow your students to specifically develop one or more of these skill categories (thinking, communication, social, self-management or research).

Topic	Contribution to the development of students' approaches to learning skills (including one or more skill category)
8.1 Energy Sources	Students are asked to prepare a presantation about one of energy sources to generate electricity in pairs or groups. At the and of each presentation there is an disccussiın sesion. Having discussions and negotiate ideas and knowledge with peers, classmates and teachers about advantages and disadvantges of using that specific energy source to develop students' thinking and communicative skills. Active participation of students into discussions about this controversial issue opens an opportunity window to improve their thinker and communicator characteristics.

8. **International mindedness**

Every IB course should contribute to the development of international-mindedness in students. As an example of how you would do this, choose one topic from your outline that would allow your students to analyse it from different cultural perspectives. Briefly explain the reason for your choice and what resources you will use to achieve this goal.

Topic	Contribution to the development of international mindedness (including resources you will use)

1.1 Measurement in Physics	Students will be aware that scientific collaboration is able to be truly global without the restrictions of national borders or language due to the agreed standards for data representation and notation. By this way people all around the world are able to use same scientific languange.

9. **Development of the IB learner profile**

Through the course it is also expected that students will develop the attributes of the IB learner profile. As an example of how you would do this, choose one topic from your course outline and explain how the contents and related skills would pursue the development of any attribute(s) of the IB learner profile that you will identify.

Topic	Contribution to the development of the attribute(s) of the IB learner profile
8.1 Energy Sources	Students are asked to prepare a presantation about one of energy sources to generate electricity in pairs or groups. At the and of each presentation there is an disccussiin sesion. Having discussions and negotiate ideas and knowledge with peers, classmates and teachers about advantages and disadvantges of using that specific energy source to develop students' thinking and communicative skills. Active participation of students into discussions about this controversial issue opens an opportunity window to improve their thinker and communicator characteristics.