Diploma Programme subject outline—Group 4: sciences			
School name	International School of tallinn	**School code**	
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	Tracy Anne Wenzinger	**Date of IB training**	August 20-22,2021
Date when outline was completed	October 4,2021	**Name of workshop** *(indicate name of subject and workshop category)*	Category 1 - DP Physics

* 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 2 classes.	Assessment instruments to be used	Resources *List the main resources to be used, including information technology if applicable.*
Year 1	Course I - Measurements, Mechanics, Circular motion and Gravitation	**Core topics:** - Measurements is physics - Uncertainties and errors - Vectors and scalars - Motion - Forces - Work, Energy and Power - Momentum and Impulse - Circular Motion - The law of gravitation **Additional HL topics:** - Beginnings of relativity - Lorentz transformations - Space-time diagrams	35 classes total -18 weeks	20 labs 7 Problem worksheets 4 mini tests 2 research research papers 2 projects	Pearson Baccalaureate SL IB Physics Cambridge Physics for the IB DIploma Oxford Study Course Home - Physics Fuse School Videos Physicsclassroom.com Explorelearning.com Discovering STEM Physics Resource Master Set Lab Equipment
	Course 2 - Thermal Physics and Waves	**Core topics:** - Thermal	35 classes total -18 weeks		

		concepts - Modeling a gas - Oscillations - Traveling waves - Wave characteristics - Wave behavior - Standing waves - Introduction to Imaging - Imaging instrumentation - Fiber optics **Additional HL topics:** - Simple Harmonic Motion - Single-slit diffraction - Interference - Resolution - Doppler Effect			
Year 2	Course 1 - Electricity and Magnetism	**Core topics:** - Electric Fields - Heating effect of electric currents - Electric cells - Magnetic fields - Describing fields - Fields at work - Electromagnetism - Power	35 classes total -18 weeks	18 labs 9 Problem worksheets 4 mini tests 2 research research papers 2 projects	Pearson Baccalaureate SL IB Physics Cambridge Physics for the IB DIploma Oxford Study Course Home - Physics Fuse School Videos

		Additional HL topics: - Describing fields - Fields at work - Electromagnetic induction - Transmission of power - Capacitance			Physicsclassroom.com Explorelearning.com Discovering STEM Physics Resource Master Set Lab Equipment
	Course 2 -Atomic, nuclear and particle physics, Energy production, and Astrophysics	**Core topics:** - Discrete energy and radioactivity - Nuclear reactions - Nuclear physics - Structure of matter - Energy sources - Thermal Energy Transfer - Stellar quantities - Stellar characteristics - Big Bang - Cosmology **Additional HL topics:** - Interaction of matter with radiation - Nuclear physics			

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 will work on the Kepler exoplanet project classifying which planets could be considered habitable. This project could be incorporated into maths, english, and art. Students would use their physics and maths knowledge to determine which planets the Kepler and K2 project classify as habitable. In English, students will study the writings of various science fiction authors to debate and expand what types of life could exist. The arts (music) will play a role in how we transmit messages across the universe. Students will prepare a presentation that highlights a “habitable” planet and includes how scientists could reach out to extraterrestrial life.

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.*
Measurements, Mechanics, Circular motion and Gravitation	Vectors	yes - projectors, laptops
	Projectile Motion	yes - tablets, PASCO bluetooth stem sensors, digital camera
	Golf Range	yes - video game
	Friction - Sliding Objects	no
	Speed of toy car	yes - tablets, PASCO bluetooth stem sensors,
	Power	yes- tablets, PASCO bluetooth stem sensors,
	Energy of spring	yes- tablets, PASCO bluetooth stem sensors,
	Elastics Collisions	yes- tablets, PASCO bluetooth stem sensors,

	Pendulum	yes- tablets, PASCO bluetooth stem sensors, digital camera
	Uniform circular motion	yes - tablets, PASCO bluetooth stem sensors,
	Planets and Universal Gravitational	yes - web boards, laptops
Thermal Physics and Waves	Temperature and Particle Motion	yes- tablets, PASCO bluetooth stem sensors, projectors
	Calorimetry Lab	yes . tablets, PASCO bluetooth stem sensors,
	Ideal Gas Law	yes - tablets, PASCO bluetooth stem sensors, projectors
	Greenhouse Effect	yes - laptops, webboards,
	Exploring waves	no
	Sound Beats and Sine Waves	yes - microphones
	Snell's Law	no
	Doppler Shift	yes - laptops, microphones
	Ray Tracing lenses	no
Electricity and Magnetism	Electricity 101	no
	Coulomb Force	yes - laptops
	Circuits	no
	Advanced Circuits	yes -tablets, PASCO bluetooth stem sensors, projector
	Resistance	yes - tablets, PASCO bluetooth stem sensors, projector
	Compasses and Currents	no

	Magnets and Currents	no
	Electromagnet	yes- tablets, PASCO bluetooth stem sensors, projector
	Forces on Currents in Magnetic Fields	no
	Electric Motors	yes - tablets PASCO bluetooth stem sensors,
Atomic, nuclear and particle physics, Energy production, and Astrophysics	Half Life	no
	Simulating Nuclear Decay Reactions	yes laptops, projector
	Fission vs Fusion	no
	Household Energy Use	yes - laptops, PASCO bluetooth stem sensors, projector
	Galaxy lab	yes - laptops, web boards
	Big Bang Theory & Hubble's Law	yes - laptops, web boards, digital cameras
	Star Spectra	yes - laptops, web boards, digital cameras
	Solar System lab - Kepler's Law	yes - laptops

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.

Currently there is a shared science laboratory space in the school. Students can perform small experiments at their desks and in the hallways. Students use PASCO stem equipment with SPARKVue technology in addition to physical ramps, cars, balls, pulleys, springs, stopwatches, electrical boards, tuning forks, optical equipment, lasers, and calorimeters. In addition, laboratory simulations are performed using physicsclassroom.com, PhET, and explorelearning.com gizmos. A full laboratory space is being built in the new school building (2022-23) which will allow for students to perform additional practical work.

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.

Students have access to Oxford Scholar Course Home in addition to online simulation subscriptions including PASCO Physics, explorelearning.com gizmos. Students and teachers have access to both Pearson's and Cambridge's Physics for the IB Diploma SL and HL

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)
Thermal Physics	We perceive how hot or cold something is with our senses but to qualify this we need a measurement. Students will study how different objects feel and then record their temperatures. Students will compare and contrast their qualitative and quantitative findings in an analysis report.
Astrophysics	We cannot see ultraviolet radiation but we can look at a digitally enhanced image from a UV telescope. Students will study digitally enhanced images and determine what they are actually looking at. Students will then reflect on their findings in a research paper.

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)
Measurements, Mechanics, Circular motion and Gravitation	Critical Thinking and Transfer skills in labs and mini-tests. Self- management skills in course projects. Transfer and creative thinking skills in their designing a roller coaster or parachute project.

Thermal Physics and Waves	Critical Thinking skills and transfer in labs and min-tests. Self- management skills in course paper. Research skills in their research paper on optical imaging essay.
Electricity and Magnetism	Critical Thinking skills in labs and min-tests. Self- management skills in course projects. Transfer and creative thinking skills in their construct an alarm project..
Atomic, nuclear and particle physics, Energy production, and Astrophysics	Critical Thinking skills in labs and min-tests. Self- management skills in course projects. Research and Communication skills in the Kepler exoplanet presentation.

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)
Measurements, Mechanics, Circular motion and Gravitation	Not all countries use the same units of temperature when describing the weather, but the agreed upon SI unit is the Kelvin. Students will create a table of SI units and common units based on the country/region they are from. This will allow students a chance to share their previous knowledge in a fun and exciting way
Atomic, nuclear and particle physics, Energy production, and Astrophysics	Students will research using the internet the main types of energy sources their home country uses. We will create a giant world map of energy sources. By looking at patterns we can discuss trends in non renewable and renewable energy sources.

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
Measurements, Mechanics, Circular motion and Gravitation	Inquirers nurture their curiosity by developing their skills for inquiry and research. Students will learn independently and with others. Students will understand how motion and forces relate to each other through a series of laboratory explorations.
Thermal Physics and Waves	Communicators express themselves confidently and creatively in more than one language and in many ways. Students will study how sound and light waves are unique forms of communication that can be simplified into mathematical equations.
Electricity and Magnetism	Balanced learners understand the importance of balancing different aspects of their lives, intellectual, physical, and emotional to achieve well being for themselves and others. Understanding and studying the various interactions between electricity and magnetism, students will comprehend the balance in the forces of electromagnetism.
Atomic, nuclear and particle physics, Energy production, and Astrophysics	Open-minded learners critically appreciate our own cultures and personal histories, as well as the values and traditions of others. We seek and evaluate a range of points of view, and we are willing to grow for the experience. As we study nuclear and astrophysics, students must understand the past in order to shed light on what the future and the universe holds.