Physics (Senior Secondary)

1. Introduction

Physics is one of the fundamental natural sciences. It involves the study of universal laws, and of the behaviours and relationships among a wide range of physical phenomena. Through the learning of physics, students will develop scientific literacy and the essential scientific knowledge and skills for lifelong learning in science and technology. At HKUGAC, the physics course will provide a platform for acquiring conceptual and procedural knowledge relevant to daily life. With a solid foundation in physics, students should be able to appreciate both the intrinsic beauty and quantitative nature of physical phenomena, and the role of physics in many important developments in engineering, medicine, economics and other fields of science and technology.

Teaching methods

The key knowledge, skills, values and attitudes that students are to develop at senior secondary level are embodied in the appropriate level of curriculum.

1.1 Contextual approach

Students will discover what interests them through the study of selected topics within the compulsory parts in S4 and S5, and then make informed choices as they progress through S6 for the investigative study.

1.2 Scientific investigations

Students will be guided to conduct an investigation with a view to solving an authentic problem within a 16 hour investigative study or research. In which they will propose hypotheses for scientific phenomena and devise methods to carry out experiments, record experimental observations, analyze data and produce reports on their investigations.

1.3 Problem-based learning

A series of lessons will be provided to train students for adapting appropriate strategies to deal with issues that may arise. Students will be expected to clarify and analyze problems related to physics. During which, they will apply knowledge and principles of physics to solve problems or suggest creative ideas or solutions to problems.

1.4 Issue-based learning

Inquiry activities will be provided that will help students make decisions based on the examination of evidence and arguments. Students will be challenged to support judgments using appropriate scientific principles and put forward suitable reasoning to choose between alternatives.

1.5 Embedding of learning in real-life issues

By reading the latest research and industry products, students will be expected to appreciate the relationship between physics and other disciplines, and to be aware of the interconnections among science, technology, society, and the environment in contemporary issues, thereby becoming responsible citizens.

2. Aims and objectives

Physics education is to provide physics-related learning experiences for students to develop scientific literacy, so that they can participate actively in our rapidly changing knowledge-based society, prepare for further studies or careers in fields related to physics, and become lifelong learners in science and technology. The broad aims of the curriculum are to enable students to:

1. develop interest in the physical world and maintain a sense of wonder and curiosity about it;
2. construct and apply knowledge of physics, and appreciate the relationship between physical science and other disciplines;
3. appreciate and understand the nature of science in physics-related contexts;
4. develop skills for making scientific enquiries;
5. develop the ability to think scientifically, critically and creatively, and to solve problems individually or collaboratively in physics-related contexts;
6. understand the language of science and communicate ideas and views on physics-related issues;
7. make informed decisions and judgments on physics-related issues;
8. be aware of the social, ethical, economic, environmental and technological implications of physics, and develop an attitude of responsible citizenship.

3. Curriculum

The curriculum framework for Physics embodies the key knowledge, skills, values and attitudes that students are to develop at senior secondary level.

3.1 Curriculum framework

Compulsory Part

	Topics
S4	Force and motion
	Work, energy, and power
	Momentum
	Lenses
	Nature and properties of waves
	Light and Sound
	Change of state
S5	Projectile motion
	Uniform circular motion and gravitation
	Gas laws and kinetic theory
	Electrostatics
	Circuits and domestic electricity
	Electromagnetism and Induction
	Radiation and radioactivity
	Nuclear energy

Elective Part

S6	Photoelectric effect
	Atomic models
	Nanotechnology
	Electricity at home
	Energy efficiency in building and transportation
	Renewable and non-renewable energy sources

3.2 Delivery schedule

	S4	**S5**	**S6**
1st term	Vertical motion Newton's Laws of motion Moment of a force Work, energy, and power Momentum	Projectile motion Circular motion Gravitation Gas laws and kinetic theory Electrostatics Circuits and power	Photoelectric effect Atomic models and spectra Nanotechnology Lighting Cooking and air-conditioning Building and transportation Energy sources
2nd term	Wave motion Wave properties Light and sound waves Lenses Latent heat	Domestic electricity Magnetic force and field Electromagnetic induction Alternating currents Radiation and radioactivity Nuclear energy	

4. Assessment

4.1 Internal assessment

4.1.1 Assessment criteria

4.1.1.1 Assessment of knowledge and understanding

Students are expected to:

1. understand phenomena, facts and patterns, principles, concepts, laws, theories and models in physics;
2. learn the vocabulary, terminology and conventions used in physics;
3. acquire knowledge of techniques and skills specific to the study of physics; and
4. develop an understanding of technological applications of physics and of their social implications.

Preparation exercises, presentations, oral questioning, class assignments, module tests and an examination will be used to enable students to demonstrate their understanding and creative ideas.

4.1.1.2 Assessment of skills and processes

Students are expected to:

1. identify attributes of objects or natural phenomena;
2. examine evidence and apply logical reasoning to draw valid conclusions;
3. integrate concepts within a framework of knowledge, and apply this to new situations;
4. select appropriate methods and apparatus to carry out investigations;
5. evaluate experimental methods and suggest possible improvements;
6. support judgments using appropriate scientific principles;
7. use information technology to manage and present information, and to develop habits of self-directed learning; and
8. organize, present and communicate physics ideas in a vivid and logical manner.

Project work and practical exercises provide excellent opportunities for students to apply what they have learnt. Investigative projects, in particular, are suitable for assessing enquiry skills such as problem-solving, decision-making, information handling and communication and collaboration skills.

4.1.1.3 Assessment of values and attitudes

Students are expected to:

1. possess and develop positive values and attitudes such as curiosity, honesty, respect for evidence, perseverance and tolerance of uncertainty through the study of physics;
2. develop a habit of self-reflection and the ability to think critically;
3. develop open-mindedness and be able to show tolerance and respect towards the opinions and decisions of others even in disagreement;
4. be aware of the social, economic, environmental and technological implications of the achievements in physics,
5. recognize the consequences of the evolutionary nature of scientific knowledge and understand that constant updating of knowledge is important in the world of science and technology; and
6. recognize the importance of lifelong learning in our rapidly changing knowledge-based society.

4.1.2 Weighting of component parts

<table>
<tr><th rowspan="2">Component</th><th colspan="3">Weighting</th></tr>
<tr><th>S4</th><th>S5</th><th>S6</th></tr>
<tr><td>Continuous assessment
➢ Scientific investigations
➢ Experimental skills
➢ Quizzes and tests
➢ Assignments
➢ Preparation tasks before lessons</td><td colspan="3">40%</td></tr>
<tr><td>Examination</td><td colspan="3">60%</td></tr>
</table>

4.2 E-learning

E-learning has been implemented in the curriculum of physics, including all forms of educational technology in learning and teaching, such as multimedia learning, computer-aided instruction, internet-based training, web-based training, online education, virtual education, etc. It also provides an interactive channel for sharing between groups of students and the teacher, which complements strategies for learning both inside and outside the classroom.

E-learning also allows students to work at their own progress and gives them more time to pursue creative activities. In addition, e-learning may extend students' learning through the internet, which is an extremely valuable source of the most updated scientific information and resources. Through the use of electronic media, we aim to provide students with an enriched and efficient learning experience, to enhance self-directed learning, and meet their varied learning needs.

4.3 School-based assessment for the HKDSE Physics Examination

Students sitting the HKDSE Physics Examination will be required to take part in the SBA starting from S5 and it comprises of practical and non-practical related tasks. For practical related tasks, students are required to perform a number of pieces of practical work, which may include designing experiments, and reporting and interpreting experimental results, which are closely integrated with the curriculum content and form a part of the normal learning and teaching process. While the inclusion of non-practical related tasks is to broaden the scope of assessment in the SBA and enhances the integration of the curriculum, teaching and assessment. The tasks adopted will cover the following curriculum content areas and generic skills:

Curriculum content areas	Generic skills
● Heat and Gases ● Force and Motion ● Wave Motion ● Electricity and Magnetism ● Radioactivity and Nuclear Energy ● Atomic World ● Energy and Use of Energy	● Creativity ● Critical thinking skills ● Communication skills ● Problem-solving skills

For students sitting the HKDSE Physics Examination in 2026, the mark of SBA in practical related tasks will contribute to 20% of the final subject mark, while the public examination contributes to 80%.

4.3.1 Practical related tasks

Students are required to perform a number of pieces of practical work, which may include designing experiments, and reporting and interpreting experimental results. The work will be closely integrated with the curriculum content and form a part of the normal learning and teaching process. Students also have to design and conduct an investigative study to solve an authentic problem. In carrying this out, they are expected to make use of their knowledge and understanding of physics. Through these practical related tasks, students' practical, process and generic skills will be developed and assessed.

4.3.2 Non-practical related tasks (Optional)

Students are required to perform a number of non-practical related tasks. The inclusion of non-practical related tasks is to broaden the scope of assessment in the SBA and enhance the integration of the curriculum, teaching and assessment. To this end, the assignment tasks adopted should cover one or more of the curriculum content areas and one or more of the generic skills such as creativity, critical thinking, communication skills and problem-solving skills. Examples of such tasks include: reading critically; evaluating and reporting on the work of some physicists; designing posters/pamphlets/webpages on physics-related issues; reporting on physics knowledge and concepts acquired after a visit to a power station or the Science Museum; and building models or using IT tools to illustrate concepts of physics. Teachers can employ different means of assessing their students as appropriate. Such assignments will also be an integral part of the investigative study.

5. Role of parents at home and homework

Interest and effective learning is the key to success in the subject. To ensure effective learning in class time, students are encouraged to come fully prepared to each lesson. A preparation and reflection book system is used as a means to promote effective learning. Homework and module quizzes consolidate, reinforce and strengthen concepts learnt in class and help teachers assess the performance of students. Self-motivation for learning an interesting subject generally gives a better outcome. Zero marks will be awarded in cases of late submission of homework. Parents are encouraged to talk to their son or daughter about the work done in class and the current learning topics in order to have a better understanding of their child's learning progress in the subject and to provide an opportunity for students to revisit topics after class.