St Augustine's Catholic High School & Sixth Form

Curriculum Overview

2021 – 2022

Physics
Key Stage 5

Curriculum Overview
Physics

Autumn Term

	Y12	Y13
Autumn 1	**Content:** **HU:** Particles and radiation Particles Constituents of the atom Stable and unstable nuclei Particles, antiparticles and photons Particle interactions Classification of particles **SV:** Force, energy and momentum Scalars and vectors Moments	**Content:** **HU:** Nuclear physics Radioactivity Rutherford scattering α, β and γ radiation Nuclear instability Nuclear radius **SV:** Periodic motion Circular motion Simple harmonic motion (SHM) Simple harmonic systems Forced vibrations and resonance
	Why am I learning this? ***(ie substantive content/link to previous work)*** The Year 12 course starts with fundamental concepts in physics which reappear and link with subsequent knowledge gained throughout the course. The Particle Physics topic provides students with a core understanding of the structure of the atom and fundamental particles that make up all matter in the universe. This understanding is key to building knowledge as they move through the course. The Mechanics topic introduces the idea of interactions between objects and systems and develops maths skills needed in future topics. These are skills and knowledge which are developed further in Year 13.	**Why am I learning this?** ***(ie substantive content/link to previous work)*** Nuclear Physics builds on prior learning of the structure of the atom, fundamental particles and particle interactions studied in the Particle Physics topic in Year 12. The topic uses exponential equations which are covered in Year 12 maths. Further Mechanics builds on prior learning of Mechanics from Year 12. The mechanics of periodic and circular motion is fundamental physics which is required to understand the motion of objects in the later topic of fields.
	Assessment Focus **Deep assessment:** Assessment Week and Whole Class Feedback **Formative / maintenance assessment:** End of Chapter Assessments and Whole Class Feedback. Independent Study Logs, Low Stakes Assessment starters	**Assessment Focus** **Deep assessment:** End of Chapter Assessments and Whole Class Feedback **Formative / maintenance assessment:** Independent Study Logs, Low Stakes Assessment starters
Autumn 2	**Content:** **HU:** Quarks and antiquarks Applications of conservation laws Electromagnetic radiation and quantum phenomena The photoelectric effect Collisions of electrons with atoms Energy levels and photon emission Wave-particle duality **SV:** Motion along a straight line	**Content:** **HU:** Radioactive decay Mass and energy Induced fission Safety aspects **SV:** Gravitational fields Newton's law Gravitational field strength Gravitational potential

	Projectile motion Newton's laws of motion Momentum	Orbits of planets and satellites Electric fields Coulomb's law Electric field strength Electric potential
	Why am I learning this? ***(ie substantive content/link to previous work)*** The Particle Physics topic moves onto a deeper more advanced understanding of the constituents of matter. Students have built up the essential base knowledge in the first half term to now be introduced to more abstract concepts in the field of Quantum Phenomena. The Mechanics topic further develops maths skills to a much higher level and students can quantify how objects move and interact. These are skills which are also covered in maths and developed further in Year 13.	**Why am I learning this?** ***(ie substantive content/link to previous work)*** Nuclear Physics builds on prior learning of the structure of the atom, fundamental particles and particle interactions studied in the Particle Physics topic in Year 12. The topic uses exponential equations which are covered in Year 12 maths. Understanding fields is an essential building block of understanding physics. Electric and gravitational fields have significant similarities and by learning them consecutively students have the opportunity to link their knowledge.
	Assessment Focus **Deep assessment:** End of Chapter Assessments and Whole Class Feedback **Maintenance assessment:** Independent Study Logs, Low Stakes Assessment starters	**Assessment Focus** **Deep assessment:** Assessment Week and Whole Class Feedback **Maintenance assessment:** End of Chapter Assessments and Whole Class Feedback, Independent Study Logs, Low Stakes Assessment starters
Termly themes	**Links to Gospel Values/vocations:** Structure of the Atom – Service and Sacrifice The Photoelectric Effect – Service and Sacrifice Newtons Laws of Motion – Service and Sacrifice 1-1 Guidance linked to future study and vocations	**Links to Gospel Values/vocations:** Nuclear Fission – Tolerance and Peace Universal Field Laws Eg: Newtons Law – Service and Sacrifice 1-1 Guidance linked to future study and vocations
	Enrichment: Science Library RI Masterclasses	**Enrichment:** Science Library

Spring Term

	Y12	Y13
Spring 1	**Content:** **HU:** Progressive and stationary waves Progressive waves Longitudinal and transverse waves Principle of superposition of waves and formation of stationary waves Refraction, diffraction and interference **SV:** Work, energy and power Conservation of energy Bulk properties of solids The Young modulus	**Content:** **HU:** Thermal physics Thermal energy transfer Ideal gases Molecular kinetic theory model **SV:** Capacitance Parallel plate capacitor Energy stored by a capacitor Capacitor charge and discharge Magnetic flux density Moving charges in a magnetic field Magnetic flux and flux linkage Electromagnetic induction Alternating currents The operation of a transformer
	Why am I learning this? ***(ie substantive content/link to previous work)*** The Waves topic is a fundamental part of physics and understanding how energy travels from one place to another without transferring matter. This then leads onto the Astrophysics topic which takes concepts studied in the Waves topic and allows students to apply them to everyday examples, such as telescopes. Students develop an understanding for how we can take our core knowledge of physical phenomena and apply it to understand the universe around us. The students continue to build on knowledge in the Mechanics topic to understand how energy cannot be created or destroyed and the movement of objects requires energy. The Materials topic studies how the materials an object is made from can affect its interactions and needs to be considered when selecting materials for building and engineering. There are strong links with the A-Level Technology specification.	**Why am I learning this?** ***(ie substantive content/link to previous work)*** The Thermal Physics topic is an essential part of understanding how matter behaves. There are strong links with the A-Level Chemistry specification. The topic involves a high maths demand. Capacitance involves exponential decay so students can make links with knowledge and skills learnt in the Nuclear Physics topic. The Magnetic Fields topic links with gravitational and electric fields but extends further to how fields can be utilised in particle accelerators, generators, motors and the national grid etc. These final topics involve some of the highest demand in terms of maths skills and physics concepts. At this stage in the course students have developed a greater capacity to understand physics.
	Assessment Focus **Deep assessment:** End of Chapter Assessments and Whole Class Feedback **Formative / maintenance assessment:**, Independent Study Logs, Low Stakes Assessment starters	**Assessment Focus** **Deep assessment:** Assessment Week and Whole Class Feedback **Formative / maintenance assessment:** End of Chapter Assessments, Independent Study Logs, Low Stakes Assessment starters
Spring 2	**Content:** **HU:** Diffraction Refraction at a plane surface Telescopes Astronomical telescope consisting of two converging lenses Reflecting telescopes Single dish radio telescopes, I-R, U-V and X-ray telescopes Advantages of large diameter telescopes	**Content:** Revision of all previous topics, exam technique in preparation for end of year assessments. Development of practical skills in preparation for Paper 3A.

	SV: Current electricity Basics of electricity Current–voltage characteristics	
	Why am I learning this? ***(ie substantive content/link to previous work)*** The Waves topic is a fundamental part of physics and understanding how energy travels from one place to another without transferring matter. This then leads onto the Astrophysics topic which takes concepts studied in the Waves topic and allows students to apply them to everyday examples, such as telescopes. Students develop an understanding for how we can take our core knowledge of physical phenomena and apply it to understand the universe around us. The Electricity topic is one of the highest demanding in terms of maths skills and physics concepts from Paper 1. At this stage in the course students have developed a greater ability to understand the physics required.	**Why am I learning this?** ***(ie substantive content/link to previous work)*** Students' memory of all prior learning needs to be strengthened so that they can easily link content and coherently explain all physics concepts. Students' practical skills need to be developed to prepare them for university study, where they will be expected to complete practical work independently.
	Assessment Focus **Deep assessment:** Assessment Week and Whole Class Feedback **Maintenance assessment:** End of Chapter Assessments, Independent Study Logs, Low Stakes Assessment starters	**Assessment Focus** **Deep assessment:** In-Class Mock Assessments **Maintenance assessment:** Independent Study Logs, Low Stakes Assessments
Termly themes	**Links to Gospel Values/vocations:** Development of Telescopes – Service and Sacrifice 1-1 Guidance linked to future study and vocations	**Links to Gospel Values/vocations:** Transformers and the National Grid – Service and Sacrifice 1-1 Guidance linked to future study and vocations
	Enrichment: Science Library RI Masterclasses	**Enrichment:** Science Library

Summer Term

	Y12	Y13
Summer 1	**Content:** **HU:** Classification of stars Classification by luminosity Absolute magnitude, M Classification by temperature, black-body radiation Principles of the use of stellar spectral classes The Hertzsprung-Russell (HR) diagram Supernovae, neutron stars and black holes **SV:** Resistivity Potential divider Electromotive force and internal resistance	**Content:** Revision of all previous topics, exam technique in preparation for end of year assessments. Development of practical skills in preparation for Paper 3A.
	Why am I learning this? ***(ie substantive content/link to previous work)*** Students build on from their knowledge of telescopes taught at the start of the Astrophysics topic and study how we can analyse and link the data we gather into studying, identifying and classifying objects in the universe such as stars, supernovae, neutron stars, blackholes etc. The topic involves a high demand on maths in the use of exponential equations which students also cover in Year 12 maths. The Electricity topic continues to use high demanding maths skills and develops abstract physics concepts in electromotive force and internal resistance. At this stage in the course students have developed a greater ability to understand the physics required.	**Why am I learning this?** ***(ie substantive content/link to previous work)*** Students' memory of all prior learning needs to be strengthened so that they can easily link content and coherently explain all physics concepts. Students' practical skills need to be developed to prepare them for university study, where they will be expected to complete practical work independently.
	Assessment Focus **Deep assessment:** End of Chapter Assessments and Whole Class Feedback **Formative / maintenance assessment:** End of Chapter Assessments, Independent Study Logs, Low Stakes Assessment starters	**Assessment Focus** **Deep assessment:** Final Exams **Formative / maintenance assessment:** Independent Study Logs, Low Stakes Assessments
Summer 2	**Content:** **HU:** Doppler effect Hubble's law Quasars Detection of exoplanets **SV:** Periodic motion Circular motion	**Content:** NA
	Why am I learning this? ***(ie substantive content/link to previous work)*** The later part of the Astrophysics topic links prior learning and knowledge from the Waves topic with the Doppler effect and how we know the universe is expanding. It continues to build on knowledge gained of the universe and allows students to study some of the current areas of Astrophysics research such as the search for exoplanets.	**Why am I learning this?** ***(ie substantive content/link to previous work)*** NA

	Further Mechanics builds on prior learning of Mechanics from the start of Year 12. The mechanics of periodic and circular motion is fundamental physics which is required to understand the motion of objects in the later topic of fields in Year 13.	
	Assessment Focus **Deep assessment:** End of Year 12 Assessments and Whole Class Feedback **Maintenance assessment:** End of Chapter Assessments, Independent Study Logs, Low Stakes Assessment starters	**Assessment Focus** **Deep assessment:** NA **Maintenance assessment:** NA
Termly themes	**Links to Gospel Values/vocations:** Cosmology – Service and Sacrifice Hubble's Law– Service and Sacrifice 1-1 Guidance linked to future study and vocations	**Links to Gospel Values/vocations:** 1-1 Guidance linked to future study and vocations
	Enrichment: Science Library RI Masterclasses	**Enrichment:** Science Library