West Kirby Grammar School

Curriculum Map – Year 11 Separates – Physics (2026-27)

Topic name	Term	Skills developed	Link to NC subject content and beyond	Prior learning	Next link in curriculum
4.5 Forces	*Autumn*	Represent forces using vector diagrams and free-body diagrams. Calculate resultant forces, acceleration, momentum and stopping distances. Apply Newton's Laws to unfamiliar situations. Interpret motion graphs including distance-time and velocity-time graphs. Conduct investigations into force, extension and acceleration. Evaluate experimental methods involving friction, elasticity and motion. Analyse relationships between variables using graphical data. Across all eight topics, pupils progressively develop the ability to: • Apply mathematical equations confidently, including rearranging formulae and using standard units. • Interpret and construct graphs, identifying patterns, trends and relationships. • Analyse experimental data and draw evidence-based conclusions.	Engineers analyse forces when designing a great variety of machine and instruments, from road bridges and fairground ride to atomic force microscopes. Anything mechanical can be analysed in this way. Recent developments in artificial limbs use the analysis of forces to make movement possible. **This unit covers -** **4.5.1 Forces and their interactions** 4.5.1.1 - Scalar and vector quantities 4.5.1.2 - Contact and non-contact forces 4.5.1.3 - Gravity 4.5.1.4 - Resultant forces **4.5.2 Work done and energy transfer** **4.5.3 Forces and elasticity** **4.5.4 Moments, levers and gears** **4.5.5 Pressure and pressure differences in fluids** 4.5.5.1 - Pressure in a fluid 4.5.5.2 - Atmospheric pressure **4.5.6 Forces and motion** 4.5.6.1 - Describing motion along a line 4.5.6.2 - Forces, accelerations and newtons laws of motion 4.5.6.3 - Forces and braking **4.5.7 Momentum** 4.5.7.1 - Momentum is a property of moving objects 4.5.7.2 - Conservation of momentum 4.5.7.3 - Changes in momentum	***Links from prior topics:*** This unit builds on the work covered in the year 7 unit of forces, year 8 moving by force and year 9 hidden forces. Pupils should be able to identify contact and non-contact forces, describe balanced and unbalanced forces, calculate speed, interpret simple distance–time graphs, understand gravity, friction, air resistance and upthrust qualitatively, and explain deformation using ideas of stretching and compression.	***Links to future topics:*** Forces is one of the most significant progression routes into A Level. GCSE concepts are extended throughout **Module 3: Forces and Motion**, including vector analysis, projectile motion, Newton's laws, momentum, impulse, work, power and materials. The topic also supports **Module 5**, where students apply mechanics to circular motion, simple harmonic motion, gravitational fields and orbital mechanics using advanced mathematical techniques.

		• Plan, carry out and evaluate practical investigations, including identifying variables, risks and sources of error. • Use scientific models to explain observations and predict outcomes. • Evaluate evidence and make justified scientific judgements. • Communicate scientific ideas using accurate terminology and appropriate diagrams. • Solve unfamiliar problems by applying physics principles to new contexts. • Develop quantitative reasoning through proportionality, algebra, graph interpretation and data analysis,			
4.6 Waves	*Autumn / Spring*	Describe wave behaviour using scientific vocabulary including frequency, wavelength and amplitude. Calculate wave speed and apply wave equations. Interpret wave diagrams and electromagnetic spectrum data.	Wave behaviour is common in both natural and manmade situations. Wabs carry energy from one place to another and can also carry information. Designing comfortable and safe structures such as bridges, houses and music performance halls requires an understanding of mechanical waves. Modern technologies such as imaging and communication systems show how we can make the most of electromagnetic waves. **This unit covers -**	This unit builds on the work covered in the year 7 unit sound and light, year 8 making images and year 9 waves. Pupils should be able to distinguish transverse and longitudinal waves, describe wave transfer	GCSE wave behaviour provides the foundation for **Module 4: Waves and Photons**. Students develop a mathematical understanding of wave motion, superposition, stationary waves, diffraction, interference, polarisation and the wave-

		Explain reflection, refraction and diffraction using wave models. Analyse ray diagrams for lenses and mirrors. Carry out required practicals investigating waves and light. Evaluate evidence relating to communication technologies and wave applications.	**4.6.1 Waves in air, fluids and solids** 4.6.6.1 - Transverse and longitudinal waves 4.6.1.2 - Properties of waves 4.6.1.3 - Reflection of waves 4.6.1.4 - Sound waves 4.6.1.5 - Waves for detection and exploration **4.6.2 Electromagnetic waves** 4.6.2.1 - Types of electromagnetic waves 4.6.2.2 - Properties of electromagnetic waves 1 4.6.2.3 - Properties of electromagnetic waves 2 4.6.2.4 - Uses and applications of electromagnetic waves 4.6.2.5 - Lenses 4.6.2.6 - Visible light **4.6.3 Black body radiation** 4.6.3.1 - Emission and absorption of infrared radiation 4.6.3.2 - perfect black bodies and radiation	without transfer of matter, explain reflection and refraction qualitatively, understand sound as a longitudinal wave, recognise that light travels in straight lines, and relate frequency and pitch or colour.	particle duality of light. Optical principles studied at GCSE are extended through more sophisticated treatment of diffraction gratings and quantum behaviour.
4.7 Magnetism and electromagnetism	*Spring*	Explain magnetic fields using field line models. Apply Fleming's Left-Hand Rule and understand the motor effect. Explain electromagnetic induction and transformer operation. Calculate transformer relationships and electrical power transmission. Interpret experimental observations involving magnets and coils.	Electromagnetic effects are used in a wide variety of devices. Engineers make use of the fact that a magnet moving in a coil of wire can produce electric current and that when current flows around a magnet it can produce movement. It means that systems that involve control or communications can take full advantage of this. **This unit covers -** **4.7.1 Permanent and induced magnetism, magnetic forces and fields** 4.7.1.1 - Poles of a magnet# 4.7.1.2 - Magnetic fields **4.7.2 The motor effect** 4.7.2.1 - Electromagnetism 4.7.2.2 - Flemings left hand rule	This unit builds on the work covered in the year 9 unit on magnetism and electromagnetism. Pupils should understand magnetic fields around magnets, attraction and repulsion, magnetic materials, Earth's magnetic field, simple electromagnets, and how electricity and magnetism are linked. They should recognise everyday applications of electromagnets.	GCSE electromagnetism progresses directly into **Module 6: Electromagnetism**. Students extend their understanding of magnetic fields to magnetic flux density, electromagnetic induction, Faraday's and Lenz's laws, alternating current generation, transformers, electric motors and the motion of charged particles in magnetic fields. Earlier electrical knowledge from Module 4 is integrated

		Apply scientific models to explain electric motors, generators and national grid systems. Evaluate advantages of high-voltage power transmission.	4.7.2.3 - Electric motors 4.7.2.4 - Loudspeakers **4.7.3 Induced potential, transformers and the national grid** 4.7.3.1 - Induced potential 4.7.3.2 - Uses of the generator effect 4.7.3.3 - Microphones 4.7.3.4 - Transformers		with magnetic field theory to provide a unified understanding of electromagnetism.
4.8 Space	*Spring*	Apply the law of gravity to planetary motion and orbital systems. Interpret data about the Solar System, stars and galaxies. Explain stellar life cycles using evidence-based scientific models. Analyse red-shift evidence supporting the expanding universe. Evaluate competing scientific theories using observational evidence. Appreciate how technological advances improve scientific understanding of space.	Questions about where we are and where we come from have been asked for thousands of years. In the past century, astronomers and astrophysicists have made remarkable progress in understanding the scale and structure of the universe and its evolution. New questions have emerged recently. 'Dark mater', which bends light and holds galaxies together but does not emit electromagnetic radiation, is everywhere – what is it? And what is causing the universe to expand ever faster? **This unit covers -** **4.8.1 Solar system, stability of orbital motions, satellites** 4.8.1.1 - Our solar system 4.8.1.2 - The life cycle of a star 4.8.1.3 - Orbital motion, natural and artificial satellites **4.8.2 Redshift**	This unit builds on the work covered in the year 7 unit on Space. Pupils should describe the structure of the Solar System, understand that gravity governs orbital motion, explain the apparent movement of celestial bodies, understand the Earth's rotation and orbit, describe the seasons and phases of the Moon, and appreciate the scale of the Solar System.	GCSE Space provides the conceptual basis for **Module 5: Astrophysics and Cosmology**. Students develop their understanding of stellar evolution, gravitation and orbital motion into studies of luminosity, black-body radiation, the Hertzsprung–Russell diagram, cosmology, red shift, the Big Bang theory and the large-scale structure of the universe. Mathematical modelling and interpretation of astronomical observations become central to learning.