Curriculum maps with Christian and school ethos links

Subject: Physics A-level Year: 12 and 13

Topics and links	Autumn Term yr 12		Spring yr 12		Summer yr 12	
	Cycle A	Cycle B	Cycle C	Cycle D	Cycle E	Cycle F
	Physics Fundamentals **Imaging** **Testing materials**	**Looking inside materials** **Signalling** **Sensing**	**Motion** **Waves**	**Momentum, Force and Energy** **Quantum Physics**	**Year 1 (AS) review**	**Modelling Nuclear Decay** **Gravitational fields**
Links with Values and Christian ethos and spiritual development opportunities	**Fundamentals:** Being consistently rigorous in the application of fundamental skills. Being honest with oneself about being consistently the best that you can be. **Imaging:** Is what we see the whole picture? How is the idea of resolution of an image mirrored by the granularity of how we perceive the world around us. **Testing materials**	**Inside materials** The properties of materials require us to relate the micro structure to the macro properties. How do our relationships with individuals influence the community as a whole? **Signalling** What is needed to communicate – how much detail can be stripped away to still communicate with each other meaningfully? **Sensing** Useful interpretation of external stimuli is important to understand our environment. Can we analyse how quickly we	**Motion** Vectors describe quantities with magnitude and direction. Jesus' teaching gave clear direction to us all – the time and effort we put into following his direction will dictate where we end. **Waves** Through consideration of Young's double slit experiment students discover that particles can behave like waves. Students might feel deceived and tricked – this might not make sense to them. Can we build the resilience in students to adopt these new ideas that contradict	**Momentum, Force and Energy** Newton's 2nd law encapsulates that the rate of change of momentum is proportional to the force applied to an object. Students learn that even a small force can have a dramatic effect if applied for long enough. Even though we may feel like individuals with no impact – what can we see happen if we persevere with what we believe in? **Quantum physics** Following on from the waves topics, students learn that waves can also be seen to behave like particles. When examining the photovoltaic effect, students come to discover that electrons will not be emitted unless an EM wave of a sufficiently high	In this review period, students need to be honest with themselves to identify and overcome their weaknesses. Students need to have the resilience to see it through and the courage to take ownership for their own outcomes.	**Nuclear decay** Radioactive decay is spontaneous and random. It is impossible to identify which nucleus will be the next to decay or when. Students should consider what events in their life are random and which they can influence. How does a religious belief affect an individual's outlook related to real 'luck' and perceived 'luck' in outcomes. **Gravitational fields** Newton's universal law of gravitation suggests a simple

	Tough / strong / weak and brittle all have specific meanings. When we look at ourselves – how would we describe ourselves?	respond to stimuli, how much our own outputs are influenced by the input stimuli. Would we want to have different responses?	the world as they have experienced it before?	frequency hits a surface. Can students think of single individuals or acts they have witnessed that have truly inspired them, when hundreds of louder voices have failed to have an impact?		relationship between the mass of a body and force bettwen it and every other particle of mass in the Universe. However, it doesn not explain *why* matter behaves this way. Students should consider whether it it is reasonable for Newton (and us) to apply this law to the whole universe. Can we make conclusions where we can't measure the forces in action?

Topics and links	Autumn Term yr 13		Spring yr 13		Summer yr 13	
	Cycle A	**Cycle B**	**Cycle C**	**Cycle D**	**Cycle E**	**Cycle F**
	Modelling capacitor decay **Special relativity**	**Simple Harmonic motion** **Gas laws**	**Inside the atom** **Electromagnetism**	**Using the atom** **Electric fields** **The Boltzmann Factor**	Exam preparation and resilience	Exams
Links with Values and Christian ethos and spiritual development opportunities	**Modelling capacitor decay** Capacitors can be used to store electrical energy for later use. Resistors connected in series with capacitors can change how long it takes a capacitor to discharge. What influences the 'discharge' or 'charge' of students' enthusiasm or motivation in their courses? **Special relativity** Einstein explained relativity using analogies (such as the light clock) and diagrams (such as space-time diagrams.) Illustrating theories in this way makes them much easier concepts	**Simple Harmonic motion** The restoring force of an oscillation is proportional to the distance away from the equilibrium position and in an opposite direction to the displacement. When we let our actions deviate from a happy equilibrium, what influences our return to the equilibrium. Is the drive to amend our ways greater the further we have deviated? **Gas laws** The derivation of the ideal gas law, that links the temperature of an object to the internal energy of its	**Inside the atom** Students are challenged to develop their models of matter to incorporate new particles such as anti-particles, quarks, neutrinos etc… The standard model is very simple (or beautiful!), but is the simplest model necessarily correct? It doesn't explain gravity, or the existence of dark matter or energy. Do we need to have explanations for everything – are some things best left unknown? **Electromagnetism** In this topic, students learn about Faraday's law: *That the induced emf is equal to the rate of change of flux.* The internet has numerous	**Using the atom** Energy released through fusion is essential for our existence. However, students discover that the temperature of the sun is insufficient for nuclei to overcome electrostatic repulsion, so there has to be additional pieces to explain the process – this is Tunneling. If tunnelling happened to us we would be able to appear on the other side of a door without having to open it. Because we can't visualise this easily it can be hard to accept this. What do we need to see relating to our religious beliefs, for us to put our faith in it? **The Boltzmann Factor** Things happen when they gain an activation energy, through successive 'lucky' collisions of particles. Can	Exam preparation and resilience and courage to face up to the challenge ahead.	Empathy and kindness to support others in their preparations.

	to grasp. Jesus' teaching was often through parables and analogies such that his followers could understand.	constituent particles, is the longest derivation that students in the course need to be able to repeat. It takes resilience to work through this and honesty with oneself to ensure that each step in the derivation is understood.	examples where people claim to get electrical energy out of a device without doing work. This would be against the law of conservation of energy. Can students make an opinion on these claims, or is the law of conservation of energy incorrect?	students chart their successive lucky occurrences that have enabled them to be where they are now?		

Sixth form Physics

1. **Courage**:

Becoming confident to face challenges in a challenging science environment.

2. **Forgiveness**:

Working in teams and accepting mistakes of team members.

3. **Honesty**:

Working independently. Students honest with themselves as well as those around them.

4. **Kindness**:

Working with peers, helping them when they struggle.

5. **Respect**:

Respecting the opinions of others.

6. **Empathy**:

Understanding that different pupils come from different backgrounds in science. Understanding how issues raised in science make others feel.

7. **Resilience**:

Completing tasks even though the style of challenge may seem daunting and new. Being able to evaluate work and learn from mistakes.