Crewe Engineering & Design UTC

Curriculum Summary – Physics (Year 11)

Autumn

P8: Forces in action

In this chapter students will:

- Compare vectors and scalars using the examples of distance and displacement along with the nature of forces.
- Describe forces acting in a wide variety of situations and understand Newton's third law.
- Learn about balanced and unbalanced forces and the application of Newton's first law of motion.
- Produce free body diagrams demonstrating the forces acting on an isolated object and determine the centre of mass of an object experimentally.
- Resolve forces at right angles to analyse systems and determine if a system is in equilibrium.

P9: Motion

In this chapter students will:

- Analyse the motion of objects in depth including the representation of motion using distance-time graphs representing single and multiple objects.
- Define acceleration in terms of changes in velocity and analyse it graphically and mathematically.
- Describe circular motion in terms of constant acceleration but with constant angular speed.
- Investigate acceleration caused by an unbalanced force on a ramp, linking acceleration to the gradient of a line on a velocity-time graph.
- Analyse the area beneath the line on a velocity-time graph and its relationship to the distance travelled by an object.
- Use the gradient of a distance-time graph to determine the speed of an object.

Spring

P10: Forces and motion

In this chapter students will:

- Determine the relationships between a force acting on an object and the acceleration, and the mass of the object and acceleration, experimentally.
- Understand Newton's second law of motion and its application and define the inertial mass of an object.
- Compare mass and weight, and analyse the forces acting on an object as it falls through a fluid and the resulting terminal velocity.
- Analyse the stopping motion of a car including the difference between thinking time and braking time.
- Calculate the size of the accelerations experienced during braking with and derive an equation involving the stopping distance.
- Investigate Hooke's law and the effect of forces on the stretching of a range of materials identifying the relationship between the force and extension.

P12: Wave properties

In this chapter students will:

- Observe and describe the properties of mechanical and electromagnetic waves in terms of energy transfer.
- Compare transverse waves and longitudinal waves by examining the relationship between the direction of propagation and the direction of the oscillations.
- Analyse wave properties and relationships between period, frequency and wave speed, frequency, and wavelength.
- Measure the speed of sound in air and the speed of ripples on water.
- Investigate the reflection and refraction of waves and the processes of absorption, transmission, and reflection of waves in terms of energy.

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Summer

P13: Electromagnetic waves

In this chapter students will:

- Describe the electromagnetic spectrum in terms of different regions related to wavelength and speed of electromagnetic waves in a vacuum.
- Use the wave equation to link wavelength and frequency and explain the application of different electromagnetic waves.
- Investigate the relationship between surface colour, temperature, and the rate of emission of infra-red radiation.
- Describe the use of radio waves in communications for television and mobile phones and the transmissions of signals through optical fibres. Describe the application of ultraviolet waves in phosphorescence and the damage these waves can cause to skin and eyes.
- Evaluate the uses of X-rays and gamma rays in medical applications and understand the process of ionisation as the cause of tissue damage.
- Understand contrast media and detection devices such as the CCD and the concept of radiation dose.

P15: Electromagnetism

In this chapter students will:

- Learn about magnetism by looking at the magnetic fields around permanent magnets and the concept of induced magnetism in some materials.
- Plot a magnetic field and the shape of the Earth's field.
- Learn about magnetic field produced by a current and investigate the factors that affect the direction and strength of this field
- Compare the field shape of a solenoid to that produced by a simple bar magnet.
- Describe how a current carrying wire placed in a magnetic field would experience the motor effect and explain how this effect could be used to create an electric motor.