VCE Physics: Sample teaching plan

Sample Course Outline – VCE Physics Unit 3: How do fields explain motion and electricity?

**Note:** This is a sample guide only and indicates one way to present the content from the Study Design over the weeks in each school term. Teachers are advised to consider their own contexts in developing learning activities: Which local fieldwork sites would support learning in the topic area? Which local issues lend themselves to debate and investigation? Which experiments can students complete within the resource limitations of their learning environments?

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| **Week** | **Area** | **Topics** | **Learning activities** |
| 1 | **How do things move without contact?** | * **Fields and interactions** (description, investigation and comparison of gravitational, magnetic and electric fields; comparison of gravitational and electric fields about a point mass or charge; application of a vector field model to magnetic phenomena; identification of fields as static or changing, and as uniform or non-uniform) | * Demonstrations: Van de Graaf generator * Laboratory stations: exploration of ‘fields’ * Experiment: Coulomb’s Law * Experiment: electric field in a wire * Experiment: investigation of the motion of a magnet as it rolls down an inclined plane |
| 2 |
| 3 | * **Effects of fields** (use of an electric field to accelerate a charge; use of a magnetic field to change the path of a charged particle; use of gravitational fields to accelerate mass) | * Practical activity: magnet and CRO investigation * Practical investigation: DC motor * Explanation of the operation of a selected electromagnetic device * Research: Maglev trains * Spreadsheet: analysis of the satellite motion of moons in the Solar System * Model: construction and calibration of an accelerometer |
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| 6 | * **Application of field concepts** (application of force due to gravity and normal force; satellite motion; analysis of force on a current carrying conductor due to an external magnetic field; operation of simple DC motors; particle accelerators) |
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| 8 | **How are fields used to move electrical energy?** | * **Generation of electricity** (magnetic flux; generation of emf; production of DC voltage in DC generators and AC voltage in alternators) | * Experiment: electromagnetic induction * Demonstrations: electromagnetic induction |
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| 10 | * **Transmission of electricity** (production of sinusoidal AC voltages; comparison of alternating voltage and constant DC voltage; conversion between values of voltage and current; transformers; power supply; use of AC power for domestic power supply) | * Investigation: deconstruction of an old computer transformer * Demonstration: transmission lines * Problem-solving: design a solution that harnesses the electric field of an electrogenic organism (electric eel) to generate electricity * Research: ‘Witricity’ |
| 11 |
| 12 | **How fast can  things go?** | * **Newton’s laws of motion** (investigation and application of Newton’s three laws of motion; uniform circular motion; natural and artificial satellites; Newton’s second law in relation to circular motion in a vertical plane; projectile motion; laws of energy and momentum conservation) | * Experiment: factors affecting projectile motion * Experiment: centripetal acceleration * Excursion: Luna Park reaction force investigations * Spreadsheet activity: satellites |
| 13 |
| 14 | * **Einstein’s special theory of relativity** (postulates for special relativity; comparison of Einstein’s special relativity with principles of classical physics; proper time; proper length; time dilation; length contraction; muons) | * Simulations: train thought experiment |
| 15 |
| 16 | * **Relationships between force, energy and mass** (impulse; work done by a constant force; energy transformations; total ‘mass-energy’ of an object; nuclear fusion) | * Experiment: elastic and sticky collisions * Experiment: changes in potential energy |
| 17 |
| 18 | **Unit revision** | | |