**SACE Stage 1 Physics Program 4 – Single Semester Pre-trade**

This program articulates with LAP 4

| **Week** | **Topic** | **Science Understanding and Activities** |
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| **Motion, Force and Energy** |
| 1 | Quantities and units | * Explore various measurement units ***(SHE)***
 |
| 1 | Velocity | * Constant velocity problems
* Average and instantaneous velocity
	+ https://phet.colorado.edu/en/simulations/category/physics/motion
 |
| 2 | Acceleration | * Calculate acceleration
* Discuss how car manufacturers quote acceleration ***(SHE)-*** consider the limitations of these specifications
 |
| 3-4 | Newton’s Laws of Motion | * Introduce Newton’s Laws of Motion and apply to vehicles and vehicle safety
* Friction (including air resistance)
	+ Investigate Newton’s Laws using motion carts and appropriate technology. ***(SIS)***
 |
| 5 | Work, energy and power | * Work and energy (focus on kinetic energy)
* Power (focus on units W, kW and horse power) ***(SHE)***
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| 6 | **SHE Task** | * Transport – online magazine article looking at the physics of one mode of transport and how it has changed over time.
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| 7 | **SAT** | * Motion, force and energy **SAT**
 |
| **Electrical Circuits** |
| 8 | Electrical Charge | * Charge and forces between charged objects
	+ van der Graaff generator
* Conductors and Insulators ***(SHE)***
* Discuss uses, costs, appropriate types in different contexts
* Pose scenarios to determine which to use
 |
| 9 | Current and Potential | * Electrical Current
* Potential difference
	+ https://phet.colorado.edu/en/simulations/category/physics/electricity-magnets-and-circuits
 |
| 9 | Resistance | * Ohm’s Law
 |
| 10 | Circuits | * Using multimeters
* Analysing series and parallel circuits ***(SIS)***
	+ Construct and analyse circuits ***(SIS)***
	+ Investigate and deconstruct the reasons for why homes have different electrical circuits - consider the limitations and risks of different circuits, and how new technologies such as smart home technology may change circuits in the future ***(SIS, SHE)***
* Ohmic and non-ohmic conductors
 |
| 11 | **Practical Investigation**  | * Circuit Analysis
 |
| 12 | Electrical Power | * Electrical Power
* Power and energy units
	+ Relate to power costs in the home
	+ Discuss power saving options
 |
| **Heat** |
| 13 | Heat Energy and Temperature | * Temperature (Particle model)
* Heat Energy
	+ Eureka! Heat video series (available on YouTube)
 |
| 13 | Heat transfer | * Heat (flow and equilibrium)
* Conduction
	+ Investigate conduction of heat through various metals ***(SIS/SHE)***
* Convection
	+ Demonstrate convection using permanganate crystals
	+ Students experiment with other ways of demonstrating convention currents
* Radiation ***(SHE)***
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| 14 | Thermal expansion | * Thermal expansion (Particle model)
	+ Demonstrate thermal expansion using ball and ring apparatus
* Bimetallic strips and thermostats
	+ Investigate various metal combinations in bimetallic strips ***(SIS)***
	+ Discuss the limitations of conclusions that could be drawn from this experiment.
* Test and / or construct a thermostat
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| 15 | Heat Capacity | * Heat Capacity
* Electrical heating (linking Electrical Circuits and Heat topic)
	+ Determine heat capacity of water using electric kettle (or calorimeter) ***(SIS)***
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| 16 | **SAT** | * Home Energy Audit
	+ Analyse home energy usage (Home Energy Audit kits available from most public libraries)
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