

# Physics Resource List

TROP ICSU  
Feb, 2023

# Lesson Plans

| # | Lesson Plan Title  | Disciplines                        | Key Topics  | Link |
|---|--|------------------------------------|---|------|
| 1 | Power, Energy, Dynamics- Wind Turbines   | Physics                            | Power, Energy, Work, Conservation of Energy                                     |      |
| 2 | Waves and Oscillations   | Physics, Earth Sciences            | Waves, Oscillations, Simple Harmonic Motion                                     |      |
| 3 | Thermodynamic Processes in the Atmosphere  | Physics                            | Thermodynamics, Thermodynamic Systems, Thermodynamic Processes- Isothermic      |      |
| 4 | Simple Harmonic Motion and Simple Harmonic Oscillators   | Physics                            | Simple Harmonic Motion (SHM), Simple Harmonic Oscillators                       |      |
| 5 | Phase Diagrams and Phase Equilibria  | Chemistry, Physics, Earth Sciences | Phase Equilibria, Phase Diagrams Feedback Mechanisms, Runaway Greenhouse Effect |      |
| 6 | Heat Transport in the Atmosphere, Hadley Circulation and Climate (Global Precipitation Patterns and Distribution of Deserts) | Geography, Earth Sciences, Physics | Hadley Cell, Hadley Circulation, Heat Transport, Atmospheric Circulation        |      |
| 7 | Coriolis Force, Coriolis Effect, and the Impact of Coriolis Effect on Climate  | Physics, Earth Sciences            | Coriolis Force and Coriolis Effect,   |      |
| 8 | Teaching Planck's Law and Blackbody Radiation through Climate-related Examples   | Physics                            | Planck's Law, Blackbody Radiation, Stefan-Boltzmann Law                         |      |

# Teaching Tools

| # | Teaching Tool Title                                  | Disciplines             | Key Topics  | Link |
|---|--|-------------------------|---|------|
| 1 | Video: Climate Change in the Physics Classroom       | Physics                 | Climate Physics   |      |
| 2 | Reading: The Physics of Climate Change               | Physics                 | Climate Physics   |      |
| 3 | Video: Climate Change: The Physics Connection        | Physics                 | Climate Physics   |      |
| 4 | Reading: A History of Climate Models                 | Physics, Earth Sciences | Climate Physics, Climate Models                                   |      |
| 5 | Video: An Introduction to Atmospheric Thermodynamics | Physics, Earth Sciences | Thermodynamics, Atmospheric Physics                               |      |
| 6 | Video: Quantum Physics                               | Physics, Earth Sciences | Quantum Physics, Electromagnetic Radiation, The Greenhouse Effect |      |
| 7 | Video: Quantum Mechanics and Climate Change          | Physics, Earth Sciences | Quantum Mechanics, Quantum Physics, Planck's Law                  |      |
| 8 | Visualization: Blackbody Spectrum                    | Physics                 | Blackbody Radiation, Electromagnetic Radiation, Planck's Law      |      |

| #  | Teaching Tool Title  | Disciplines             | Key Topics   | Link |
|----|--|-------------------------|--|------|
| 9  | Reading: Chaos Theory and Global Warming                       | Physics, Earth Sciences | Chaos Theory, Climate Models, Atmospheric Physics                          |      |
| 10 | Teaching Module: The Physics of Climate Change Prediction      | Physics                 | Climate Physics, Atmospheric Physics, Climate Models                       |      |
| 11 | Classroom/Laboratory Activity: The Coriolis Effect             | Physics, Earth Sciences | Coriolis Force   |      |
| 12 | Video: First Law of Thermodynamics                             | Physics, Earth Sciences | Thermodynamics   |      |
| 13 | Video: Clausius Clapeyron and the Second Law of Thermodynamics | Physics, Earth Sciences | Thermodynamics   |      |
| 14 | Video: Thermodynamics and the Hydrostatic Equation             | Physics, Earth Sciences | Thermodynamics   |      |
| 15 | Reading: Introduction to Planetary Energy Balance              | Physics, Earth Sciences | Planetary Energy Balance, The Greenhouse Effect, Electromagnetic Radiation |      |
| 16 | Teaching Module: Planetary Energy Balance                      | Physics, Earth Sciences | Planetary Energy Balance, The Greenhouse Effect, Electromagnetic Radiation |      |

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|----|--|---|--|------|
| 17 | Video: Radiative Transfer                                    | Physics, Earth Sciences   | Planetary Energy Balance, The Greenhouse Effect, Electromagnetic Radiation |      |
| 18 | Model/Simulator: Modeling Planetary Energy Balance           | Earth Sciences; Physics; Computer Science                             | Planetary Energy Balance, The Greenhouse Effect, Climate Models            |      |
| 19 | Model/Simulator: Milankovitch Orbital Parameters             | Earth Sciences; Physics; Mathematics and Statistics; Computer Science | Climate Models   |      |
| 20 | Reading: General Circulation Models of Climate               | Physics, Earth Sciences   | Climate Models, Climate Physics  |      |
| 21 | Reading: The Carbon Dioxide Greenhouse Effect                | Physics, Earth Sciences   | The Greenhouse Effect, Atmospheric Physics                                 |      |
| 22 | E-learning Course/Reading: 'The Discovery of Global Warming' | Physics, Earth Sciences, Environmental Sciences, Geography            | The Greenhouse Effect  |      |
| 23 | Video: Planck's Law and Earth's Climate                      | Physics, Earth Sciences   | Planck's Law, Atmospheric Physics, Stefan Boltzmann Law, Climate Physics   |      |
| 24 | Video: Physics of Scattering and Greenhouse Gases            | Physics, Earth Sciences   | Climate Physics, Atmospheric Physics, Stefan Boltzmann Law                 |      |

| #  | Teaching Tool Title  | Disciplines                        | Key Topics  | Link |
|----|--|------------------------------------|---|------|
| 25 | E-Learning Course: Atmospheric Science   | Physics, Earth Sciences            | Atmospheric Physics, Climate Physics  |      |
| 26 | Reading: Water Vapour Feedback and Earth's Climate                                 | Chemistry, Physics, Earth Sciences | Atmospheric Physics, Climate Physics  |      |
| 27 | Video: Phase Diagrams and Earth's Climate  | Chemistry, Physics, Earth Sciences | Phase Diagrams, The Greenhouse Effect   |      |
| 28 | Reading: Earth's Equable Climate   | Physics, Earth Sciences            | Hadley Circulation, Convection, Atmospheric Physics                                     |      |
| 29 | Reading: Planetary Temperatures  | Physics, Earth Sciences            | Planetary Energy Balance, Electromagnetic Radiation, Stefan Boltzmann Law, Planck's Law |      |
| 30 | Classroom/Laboratory Activity: Hadley Circulation-Heat Transport in the Atmosphere | Physics, Earth Sciences            | Hadley Circulation, Convection, Heat Transport  |      |
| 31 | Reading: Atmospheric Dynamics and Hadley Cells                                     | Physics, Earth Sciences            | Hadley Circulation, Heat Transport  |      |
| 32 | Laboratory Activity: Urban Heat Island   | Physics                            | Heat Transport, Conservation of Energy, Electromagnetic Radiation                       |      |

| #  | Teaching Tool Title   | Disciplines                        | Key Topics   | Link |
|----|---|------------------------------------|--|------|
| 33 | Reading: Simple Atmospheric Model                             | Physics, Earth Sciences            | Blackbody Radiation, Climate Model, Atmospheric Physics  |      |
| 34 | Visualization: Blackbody Radiation and Planetary Temperatures | Physics                            | Planetary Energy Balance, Blackbody Radiation, Electromagnetic Radiation, Conservation of Energy |      |
| 35 | Video: Rising Sea Surface Temperature and Hurricane Intensity | Physics, Earth Sciences            | Heat Transport, Conservation of Energy   |      |
| 36 | Visualization: Infrared Spectra of Greenhouse Gases           | Physics                            | Electromagnetic Radiation, The Greenhouse Effect   |      |
| 37 | Video: The Greenhouse Effect of the Atmosphere                | Physics, Earth Sciences            | Blackbody Radiation, Stefan Boltzmann Law  |      |
| 38 | Reading: Hadley Circulation                                   | Geography, Earth Sciences, Physics | Hadley Circulation   |      |
| 39 | Video: Coriolis Effect  |                                    | Coriolis Force, Climate Physics, Atmospheric Physics   |      |
| 40 | Video: Upwelling  | Physics, Earth Sciences, Geography | Coriolis Force, Climate Physics, Atmospheric Physics   |      |