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Student Manual

Excellence In Higher Education for Liberian Development

Developed by:

The University of Michigan

PLAYLIST

Engineering Labs - List of Open Educational Resources

Creator: Open.Michigan, University of Michigan (Updated 29 Mar 2013)

Description:

Open Educational Resources are learning materials that are free, public, and shared under licenses that allow people to copy, translate, adapt, and share with others.

Tags: labs, Engineering

1. Dr. Peter Dourmashkin, Prof. J. David Litster, Prof. David Pritchard, Prof. Bernd Surrow, **Practice Problems: Static Equilibrium of a Forearm, a Suspended Beam, a Suspended Rope, a Knee, and an Ankle** [http://ocw.mit.edu/high-school/physics/newtons-laws-of-motion/static-equilibrium-1st-law/#Practice%20Problems]
   Notes: Hands On Labs: Visualizing Vectors and Forces

   Description: Five practice problems with solutions.

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2. Dr. Peter Dourmashkin, Prof. J. David Litster, Prof. David Pritchard, Prof. Bernd Surrow, **Practice Problems: Static Equilibrium of a Forearm, a Suspended Beam, a Suspended Rope, a Knee, and an Ankle** [http://ocw.mit.edu/high-school/physics/newtons-laws-of-motion/static-equilibrium-1st-law/#Practice%20Problems]
   Notes: Hands On Labs: Visualizing Vectors and Forces

   Description: Five practice problems with solutions.

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3. GeoGebra Wiki , **Boat Landing Problem - Simulator and Animated Demo** [http://geogebrawiki.wikispaces.com/Boat-Landing-Problem]
   Notes: Hands On Labs: Visualizing Vectors and Forces

   Description: Interactive simulation.

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4. Physics Education Technology (PhET) University of Colorado, **Interactive Simulation Exercises: Forces and Motion** [http://phet.colorado.edu/en/simulation/forces-and-motion]
   Notes: Hands On Labs: Visualizing Vectors and Forces

   Description: Explore the forces at work when you try to push a filing cabinet. Create an applied force and see the resulting friction force and total force acting on the cabinet. Charts show the forces, position, velocity, and acceleration vs. time. View a Free Body Diagram of all the forces (including gravitational and normal forces). Teaching ideas for interactive and reflective exercises are listed at the bottom of the page.

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5. Physics Education Technology (PhET) University of Colorado, **Interactive Simulation and Exercises: The Ramp** [http://phet.colorado.edu/en/simulation/the-ramp]
   Notes: Hands On Labs: Visualizing Vectors and Forces

   Description: Explore forces, energy and work as you push household objects up and down a ramp. Lower and raise the ramp to see how the angle of inclination affects the parallel forces acting on the file cabinet. Graphs show forces, energy and work. Teaching ideas for interactive and reflective exercises are listed at the bottom of the page.

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6. Physics Education Technology (PhET) University of Colorado, **Interactive Simulation and Exercises: Ramp: Forces and Motion** [http://phet.colorado.edu/en/simulation/ramp-forces-and-motion]
   Notes: Hands On Labs: Visualizing Vectors and Forces

   Description: Explore forces and motion as you push household objects up and down a ramp. Lower and raise the ramp to see how the angle of inclination affects the parallel forces. Graphs show forces, energy and work. Teaching ideas for interactive and reflective exercises are listed at the bottom of the page.

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7. Physics Education Technology (PhET) University of Colorado, **Interactive Simulation and Exercises: Masses and Springs** [http://phet.colorado.edu/en/simulation/mass-spring-lab]
   Notes: Hands On Labs: Visualizing Vectors and Forces

   Description: A realistic mass and spring laboratory. Hang masses from springs and adjust the spring stiffness and damping. You can even slow time. Transport the lab to different planets. A chart shows the kinetic, potential, and thermal energy for each spring.Teaching ideas for interactive and reflective exercises are listed at the bottom of the page.

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8. Physics Education Technology (PhET) University of Colorado, **Interactive Simulation and Exercises: Forces in 1 Dimension** [http://phet.colorado.edu/en/simulation/forces-1d]
   Notes: Hands On Labs: Visualizing Vectors and Forces

   Description: Explore the forces at work when you try to push a filing cabinet. Create an applied force and see the resulting friction force and total force acting on the cabinet. Charts show the forces, position, velocity, and acceleration vs. time. View a Free Body Diagram of all the forces (including gravitational and normal forces). Teaching ideas for interactive and reflective exercises are listed at the bottom of the page.

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9. Physics Education Technology (PhET) University of Colorado, **Interactive Simulation and Exercises: The Moving Man** [http://phet.colorado.edu/en/simulation/moving-man]
Notes: Hands On Labs: Visualizing Vectors and Forces

Description: Learn about position, velocity, and acceleration graphs. Move the little man back and forth with the mouse and plot his motion. Set the position, velocity, or acceleration and let the simulation move the man for you. Teaching ideas for interactive and reflective exercises are listed at the bottom of the page.

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10. Physics Education Technology (PhET) University of Colorado, **Interactive Simulation and Exercises: Gravity Force Lab** [http://phet.colorado.edu/en/simulation/gravity-force-lab]
Notes: Hands On Labs: Visualizing Vectors and Forces

Description: Visualize the gravitational force that two objects exert on each other. Change properties of the objects in order to see how it changes the gravity force. Teaching ideas for interactive and reflective exercises are listed at the bottom of the page.

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11. Physics Education Technology (PhET) University of Colorado, **Interactive Simulation and Exercises: Pendulum Lab** [http://phet.colorado.edu/en/simulation/pendulum-lab]
Notes: Hands On Labs: Visualizing Vectors and Forces

Description: Play with one or two pendulums and discover how the period of a simple pendulum depends on the length of the string, the mass of the pendulum bob, and the amplitude of the swing. It's easy to measure the period using the photogate timer. You can vary friction and the strength of gravity. Use the pendulum to find the value of g on planet X. Notice the anharmonic behavior at large amplitude. Teaching ideas for interactive and reflective exercises are listed at the bottom of the page.

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12. GeoGebra Wiki , **Visualize 3-D: Unit Directional Vectors of Line** [http://www.youtube.com/watch?v=6hk-PwDkUuU]
Notes: Hands On Labs: Visualizing Vectors and Forces

Description: Narrated 7-minute video with problem and 3-D graph.

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13. Khan Academy, **Example Problems: Tension** [http://www.khanacademy.org/video/introduction-to-tension?playlist=Physics, http://www.khanacademy.org/video/tension--part-2?playlist=Physics]
Notes: Hands On Labs: Visualizing Vectors and Forces

Description: Narrated 10 minute videos.

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14. Khan Academy, **Newton's First, Second, and Third Laws of Motion** [http://www.khanacademy.org/video/newton-s-first-law-of-motion?playlist=Physics, http://www.khanacademy.org/video/newton-s-second-law-of-motion?playlist=Physics, http://www.khanacademy.org/video/newton-s-third-law-of-motion?playlist=Physics]
Notes: Hands On Labs: Visualizing Vectors and Forces
Description: Narrated 7 - 10 minute videos

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15. TeachEngineering, **Hands-on Activity: Energy Forms and States Demonstrations** [http://www.oercommons.org/courses/energy-forms-and-states-demonstrations/view]
Notes: Hands On Labs: Mechanical vs. Electrical Energy

Description: Demonstrations explain the concepts of energy forms (sound, chemical, radiant [light], electrical, atomic [nuclear], mechanical, thermal [heat]) and states (potential, kinetic).

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16. TeachEngineering, **Hands-on Activity: Ramp and Review (for High School)** [http://www.teachengineering.org/view_activity.php?url=http://www.teachengineering.org/collection/cub_/activities/cub_energy/cub_energy_lesson05_activity2.xml]
Notes: Hands On Labs: Mechanical vs. Electrical Energy

Description: In this hands-on activity ? rolling a ball down an incline and having it collide into a cup ? the concepts of mechanical energy, work and power, momentum, and friction are all demonstrated. During the activity, students take measurements and use equations that describe these energy of motion concepts to calculate unknown variables and review the relationships between these concepts.

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17. TeachEngineering, **Hands-on Activity: Swinging Pendulum (for High School)** [http://www.teachengineering.org/view_activity.php?url=http://www.teachengineering.org/collection/cub_/activities/cub_energy/cub_energy_lesson03_activity2.xml]
Notes: Hands On Labs: Mechanical vs. Electrical Energy

Description: This activity shows students the engineering importance of understanding the laws of mechanical energy. More specifically, it demonstrates how potential energy can be converted to kinetic energy and back again. Given a pendulum height, students calculate and predict how fast the pendulum will swing by using the equations for potential and kinetic energy. The equations will be justified as students experimentally measure the speed of the pendulum and compare theory with reality.

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18. TeachEngineering, **Hands-on Activity: Magnetic Launcher** [http://www.teachengineering.org/view_activity.php?url=http://www.teachengineering.org/collection/wsu_/activities/wsu_magnetic_launch_activity1/wsu_magnetic_launcher_activity1.xml]
Notes: Hands On Labs: Mechanical vs. Electrical Energy

Description: This activity utilizes electricity to launch a projectile instead of using mechanical energy. The goal is to have the students work with and interact with magnetic. This activity is not meant to be a course in electromagnetism, but rather a way to motivate students to explore what electricity can be used for and get the interested in pursuing an education in a STEM field. Students get introduced to magnetic induction, induced currents, and some basics of vectors. Students start with the equations of motion to find the initial velocity and then use the launchers and take the experimental data needed to find the initial velocity. Once the initial velocity has been calculated the initial energy is calculated and then the acceleration time is calculated.

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19. Prof. Kate Scholberg, Dr. Peter Dourmashkin, MIT , **Labs: Classical Mechanics** [http://ocw.mit.edu/high-school/labs/physics-mechanics-labs-from-8.01x/]
Notes: Hands On Labs: Mechanical vs. Electrical Energy

Description: Lab manuals, questions, and solutions for low voltage power supply, falling object, force between magnets, centripetal force, energy transformations, vibrating systems, angular momentum, and flow.

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20. MIT, **Physics (Electricity and Magnetism) Labs from 8.02** [http://ocw.mit.edu/high-school/labs/physics-electricity-and-magnetism-labs-from-8.02/, http://ocw.mit.edu/high-school/labs/physics-electricity-and-magnetism-labs-from-8.02x/]
Notes: Hands On Labs: Mechanical vs. Electrical Energy

Description: Fourteen labs on electricity and magnetism.

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21. Physics Education Technology (PhET) University of Colorado, **Simulations: Electricity, Magnets & Circuits** [http://phet.colorado.edu/en/simulations/category/physics/electricity-magnets-and-circuits]
Notes: Hands On Labs: Mechanical vs. Electrical Energy

Description: A collection of 23 interactive simulations, such as circuit construction, generator, semiconductors, and more.

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