Laboratory Activities for Astronomy 101 Courses

A Compilation of Free Resources

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NOTE: Astronomy educators don't always agree on what constitutes a good laboratory exercise. Some people like projects where students follow a set of specific instructions to arrive at a pre-determined conclusion, while others prefer labs that allow students to make more choices and to arrive at their own conclusions. Some like hands-on exercises, while others prefer to use the capabilities of a computer. In the list below, we do not evaluate the activities, but simply list those that are freely available on the Web. If you have free labs to suggest adding to the list, contact the author at: fraknoiandrew@fhda.edu

1. Compilations of College-level Astronomy Lab Exercises

New Mexico State University GEAS Lab Exercises (Nine exercises developed for distance learning students): http://astronomy.nmsu.edu/geas/labs/html/home.shtml

Project CLEA Lab Exercises (a suite of computer-based labs created by Larry Marschall and his staff at Gettysburg College): http://www3.gettysburg.edu/~marschal/clea/cleahome.html

Sloan Digital Sky Survey: Sky Server Projects (a wide range of activities for students at different levels): http://cas.sdss.org/dr5/en/proj/

New Mexico State University General Education Lab Exercises: http://astronomy.nmsu.edu/geas/labs/html/home.shtml

University of Colorado Astronomy Lab Manual (by a number of faculty members): http://sbo.colorado.edu/education/LabManuals/astr1010/1010Manual_S16.pdf

University of Idaho Lab Manual (exercises are found after a lot of intro astronomy material): https://www.webpages.uidaho.edu/turner/Manuals/phys104.pdf

University of Iowa's Imaging the Universe Lab Manual (intro and advanced labs): http://astro.physics.uiowa.edu/ITU/labs/

University of Michigan Lab Activities (a long list of labs; you can also go to older labs and projects from the same page): https://dept.astro.lsa.umich.edu/resources/ugactivities/index.php

University of Nebraska Online Applets Project (collection of labs, with applets and instructions): http://astro.unl.edu/naap/

University of Southern Mississippi Astronomy and Physics Lab Exercises (PDF files): https://www.usm.edu/physics/physics-and-astronomy-laboratory-information

University of Tennessee Lab Exercises (16 labs written by Meagan White): http://astrolab.phys.utk.edu/LabExercises.php

University of Victoria Student Handbook of Lab Exercises: http://www.astro.uvic.ca/~robb/lab

University of Washington Astronomy Department Lab Archive (a collection of labs and exercises by faculty and grad students): https://sites.google.com/a/uw.edu/introductory-astronomy-clearinghouse/ (click on labs in the menu at left)

2. A Few Individual Lab Exercises

Bill Gates' Great-Great-Granddaughter's Honeymoon (a top tourist sights of the solar system activity by Andrew Fraknoi, Foothill College): http://dx.doi.org/10.3847/AER2009007
Classifying Stellar Spectra (lab by Karen Castle, Diablo Valley College): http://voyager2.dvc.edu/faculty/kcastle/Classifying_stellar_spectra.htm
Determining the Extragalactic Distance Scale (a set of exercises by Diane Dutkevitch, starting with hunting Cepheids in M100 and finishing with the Hubble time): http://astro.wku.edu/labs/m100/
Discovery of Extrasolar Planets (from Guy Worthey at Washington State University): http://astro.wsu.edu/labs/Discovery-of-Extrasolar-Planets.pdf
Mars Meteorology (looking at real weather data; from Lunar and Planetary Science Institute): http://www.lpi.usra.edu/education/workshops/mars/2014/Friday/Mars_Meteorology.pdf
Timing an X-ray Pulsar (by James Humphreys; from the Rossi X-Ray Timing Explorer Learning Center): http://heasarc.gsfc.nasa.gov/docs/xte/learning_center/xray_pulsar.html
Transiting Planets (a Kepler mission lab by McConnell, et al.): https://arxiv.org/pdf/1009.3940v2.pdf
European Space Agency Exercises (4) Using Hubble Images and Data: http://sci.esa.int/education/35011-exercises-in-astronomy/

3. Collections of High-school Astronomy Activities That Could Be Adapted into Lab Exercises

Astronomical Society of the Pacific Hands-on Activities on the Web: http://www.astrosociety.org/education/activities/handson.html
Exploring Planets in the Classroom (planetary science activities from the Hawaii Space Grant Consortium): http://www.spacegrant.hawaii.edu/class_acts/
Hands-on Optics: http://spie.org/education/education-outreach-resources/hands-on-optics
Lunar and Planetary Institute Educational Activity Directory: http://www.lpi.usra.edu/education/resources/
McDonald Observatory Classroom Activities (scroll down until you get to the ones for older students): http://mcdonaldobservatory.org/teachers/classroom
NASA Mars Exploration Activities: http://mars.nasa.gov/participate/marsforeducators/
Practical Uses of Math and Science (see activities for higher grades): http://pumas.gsfc.nasa.gov/examples/index.php?order_by=grade
Seeing in the Dark (PBS) Activities: http://www.pbs.org/seeinginthedark/for-teachers/
Solar Physics and Terrestrial Effects: A Curriculum Guide (NOAA): http://www.swpc.noaa.gov/content/solar-physics-and-terrestrial-effects-curriculum-guide-teachers-grades-7-12
Swift Satellite Gamma-Ray Burst Educational Unit: http://swift.sonoma.edu/education/grb/allinoneb.pdf
Variable Star Astronomy (a sequence of activities from the American Association of Variable Star Observers): http://www.aavso.org/education/vsa
Zooniverse (citizen science) education: https://www.zooniverse.org/get-involved/education