Energy and Sustainability
Physics 3150
Topics Include:
Energy and our Planet
Environment
Hydro Energy
Fossil Fuels
Nuclear Power
Wind Energy
Biomass
Solar Energy
Electricity and the Grid
Global Distribution
Heat and Thermodynamics
Mechanical Energy
Engines and Efficiency
SYLLABUS  SPRING 2018
ENERGY  AND  SUSTAINABILITY  
PHYS-3150

Instructor: Orest G. Symko
316  J.C.  Fletcher  Building(JFB),  Tel.  (801)581-6132, e-mail: orest@physics.utah.edu
Office hours: 8:30a.m. to 9:30 a.m., Tuesday, Thursday, or by appointment
Secretary: Nancy Kurtzeborn, 201-A JFB, Tel. (801)585-1754

Aim:  The  course  is  an  introduction  to  the  global  issues  of  energy  and  sustainability  which  are
facing  us.  It  deals  with  the  conversion  of  various  forms  of  energy  for  practical  uses  around  the
world.  It  introduces  concepts  in  energy  and  the  physical  principles  used  in  transforming  energy
and  storing  it.  In  particular,  the  course  examines  energy  technologies  in  the  fuel  cycle  stage  for
fossil  energy  (oil,  gas,  synthetic),  nuclear energy  (fission,  fusion),  and  renewable  energy  (solar,
biomass,  wind,  hydro,  and  geothermal)  along  with  storage,  transmission,  disposal,  and
conservation  issues.  Energy  technology  systems  will  be  analyzed  and  evaluated  within  the
context  of  global  environmental  goals.  Historical,  international,  and  current  issues  will  also
be  presented.

W.W.  Norton  &  Co.

Tests:  1.  February  15,  2018
2.  April  12,  2018
3.  FINAL:  Tuesday,  May  1,  2018,  10:30  a.m. - 12:30  p.m.

Absolutely  NO  make-up  tests!

Grading:  2  tests  at  15%  each  30%  Information:
1  final  30%
8  assignments  at  40%
5%  Total  100%

Information:
Last  day  to  drop  classes:  Jan.19
Martin  Luther  King  Holiday:  Jan.15
President’s  Day  Holiday:  Feb. 19
Last  day  to  withdraw:  March 9
Spring  Break:  March  18-25
Classes  end:  April  24
Final  Exam  Period:  April  26-May  2

The  University  of  Utah  seeks  to  provide  equal  access  to  its  programs,  services,  and  activities  for
people  with  disabilities.  If  you  will  need  accommodations  in  the  class,  reasonable  prior  notice
needs  to  be  given  to  the  Center  for  Disability  Services,  162  Olpin  Union  Bldg,  581-5020.  CDS  will
work  with  you  and  the  instructor  to  make  arrangements  for  accommodations.  All  written
information  in  this  course  can  be  made  available  in  alternative  format  with  prior  notification  to
Center  for  Disability  Services.
1. Introduction: Energy in Our Planet.
   History, concepts, linear and exponential growth, our changing planet.

2. Energy and Its Forms.
   Conservation of energy, kinetic and potential, power, machines, GDP.

3. Thermal Energy.
   Heat, temperature, thermodynamics, heat transfer, second law of thermodynamics, heat engines, efficiency, entropy, age of our planet.

   Carbon cycle, petroleum, oil exploration, consequences, oil shale and tar sands, fracking, Hubbert's Peak.

5. Nuclear Energy.
   Fission, nuclear reactors, fusion, failures, waste, radiation, bombs.

   The Earth, generation of electricity, heat pumps.

   The Sun, solar insolation, heating and cooling, electricity, efficiency.

   Photosynthesis, energy crops, conversion, waste.

   Global wind patterns, turbines, power and efficiency, performance.

    Hydroelectric, tidal, wave energy, thermal gradients, salinity gradient.

11. Electricity.
    Generation, capacity, transmission, distribution, AC and DC, smart grids.

12. Climate.
    Science, Greenhouse effect, a tale of three planets, carbon, changes.

    Marketing, pollution, the environment, sustainability, technology, global issues.
REFERENCES:

- Homebrew Wind Power, Dan Bartmann and Dan Fink, 2009, Buckville Publications LLC.
- Energy, the Subtle Concept by Jennifer Coopersmith, Oxford University Press, 2010