

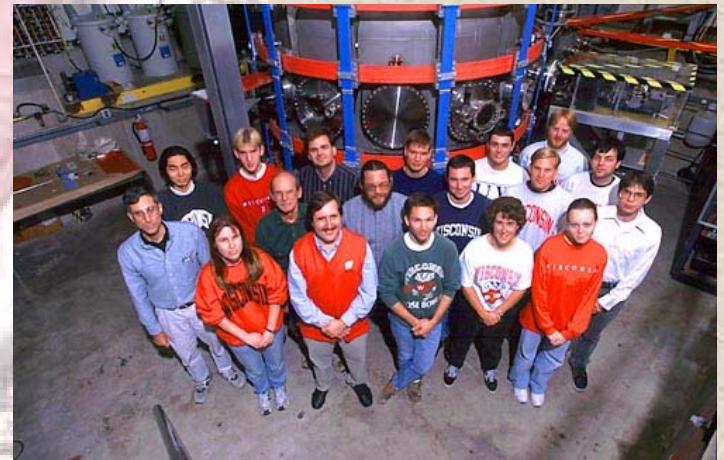
# *Department of Engineering Physics*

## *Programs in ....*



**Engineering  
Mechanics**

**Nuclear Engineering and  
Engineering Physics**



<http://www.engr.wisc.edu/ep>

## **Department Profile**

### *Degrees offered:*

**BS, MS & PhD degrees in Engineering Mechanics (EMA)**

**BS, MS & PhD degrees in Nuclear Engr & Engr Physics  
(NEEP)**

**BS degrees in Engr Physics (EP)**

**132 EMA undergrads, 95 NE undergrads, 12 EP  
undergrads**

## **Engineering Physics Dept (EMA, EP, NE) often appeals to students who:**

- **Enjoy applied math and applied physics**
- **Want to learn basic analytical and experimental methods which are applicable over broad areas of engineering and science**
- **Hope to work in advanced technology departments in industry or government labs where problems are “unusual and non-routine”**

## **ENGINEERING PHYSICS**

### **Comparison in the EMA, NEEP and EP Majors**

Subject Area	EMA	NEEP	EP
Lib. Studies & Comm.	23 cr	23 cr	23 cr
Mathematics	19 cr	19 cr	19 cr
Chem./Physics	19 cr	19 cr	<b>28 cr</b>
Engr Sciences	15 cr	19 cr	14 cr
Energy Systems	6 cr	<b>24 cr</b>	12 cr
Mech./Mat'ls.	<b>33 cr</b>	12 cr	6 cr
<u>Design/Research</u>	12 cr	12 cr	<u><b>26 cr</b></u>
Total Credits	127	128	128

## **B.S. in ENGINEERING PHYSICS**

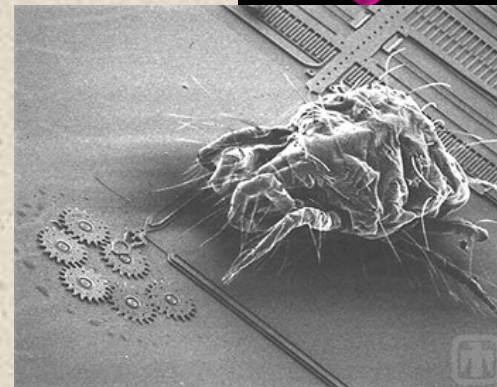
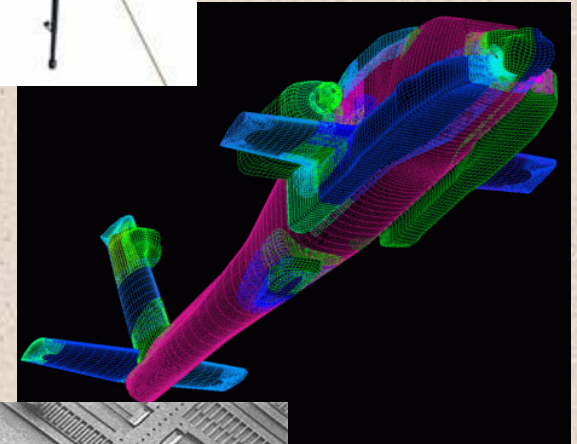
- **Research/project oriented BS degree for those interested in emerging fields of engineering**
  - Plasma science and engineering
  - Nanoscience and engineering (“nanotechnology”)
  - Scientific computation (visualization, simulation)
- **Requires a 3.5 GPA for entry and 54 credits**
- **Flexible curriculum**
- **Students do 8 credits of research and write thesis in Senior year**

## **B.S. in ENGINEERING MECHANICS**

- **Often part of Mechanical Engineering**
- **Oldest Engineering degree here at UW**
- **Engineering Mechanics is the study of:**
  - **Mechanics of materials**
  - **Solid mechanics (stress, strain, and displacements)**
  - **Fluid Mechanics**
- **Applications**
  - **Aerospace**
  - **Auto industry**
  - **Biomechanics**
  - **Nanotechnology**
  - **Many others**
- **Job market is currently excellent**
  - **Boeing, NASA, Ford, etc.**

# What is Engineering Mechanics?

- How do materials fail?
- How do we design structures (airplanes, cars, bridges, etc.) to avoid failure?
  - Static loads
  - Vibrations
  - Earthquakes
- Physics of Fluids
  - Cooling
  - Aerodynamics
- How do things change at small scales?
- Overlap with ME, CEE, MSE, BME, etc.



## **Astronautics Option**

- **Like a minor within the EMA major**
- **Topics include:**
  - **Aerodynamics**
  - **Astrodynamics**
  - **Satellite dynamics**

## What do our graduates do?

- **Structural Analysis**

- Boeing 777 was designed with extensive analysis (saves on experimentation)



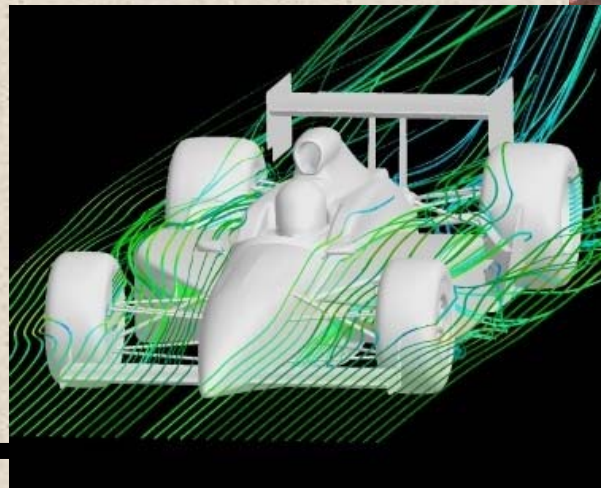
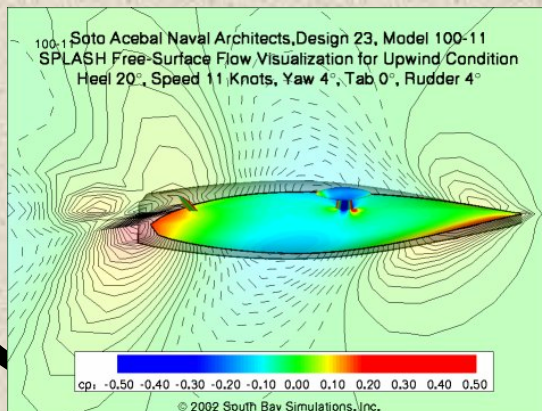
- **Experimental Mechanics**

- Analysis isn't enough: we ultimately must test



- **Fluid Mechanics**

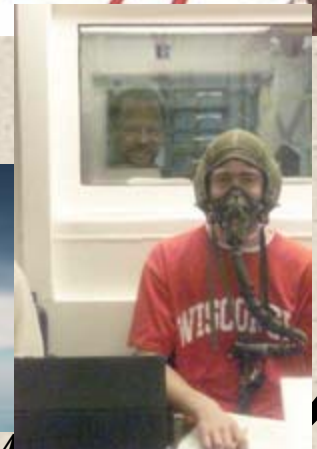
- Important to many industries and applications



## **American Institute of Aeronautics and Astronautics**

- **Active local chapter**
- **Excellent career connections**
- **Trips to NASA centers**
- **Participation in Zero-G flights**

## **EP Students Do Research in Zero-Gravity**



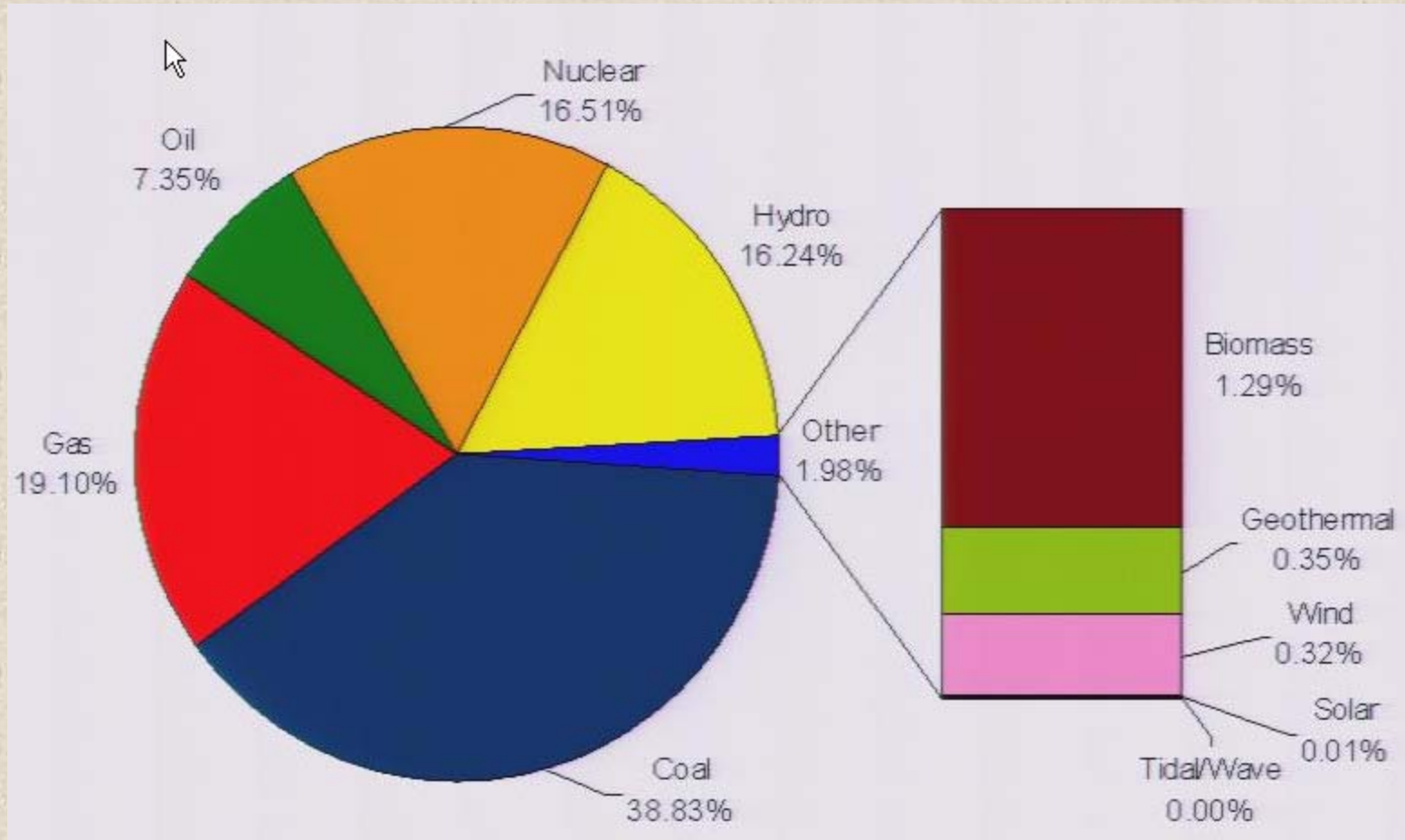
# **B.S. in NUCLEAR ENGINEERING AND ENGINEERING PHYSICS**

- **Two Tracks:**
  - **Power track:** Study the use of nuclear energy for power production
  - **Radiation Sciences track:** study the use of radiation for other applications (primarily medical treatment and diagnosis)
- **Job market is currently excellent**
  - 1/3 of students work at power plants or for designers
  - 1/3 go to graduate school
  - 1/3 do other things (med school, law school, health physics, etc.)

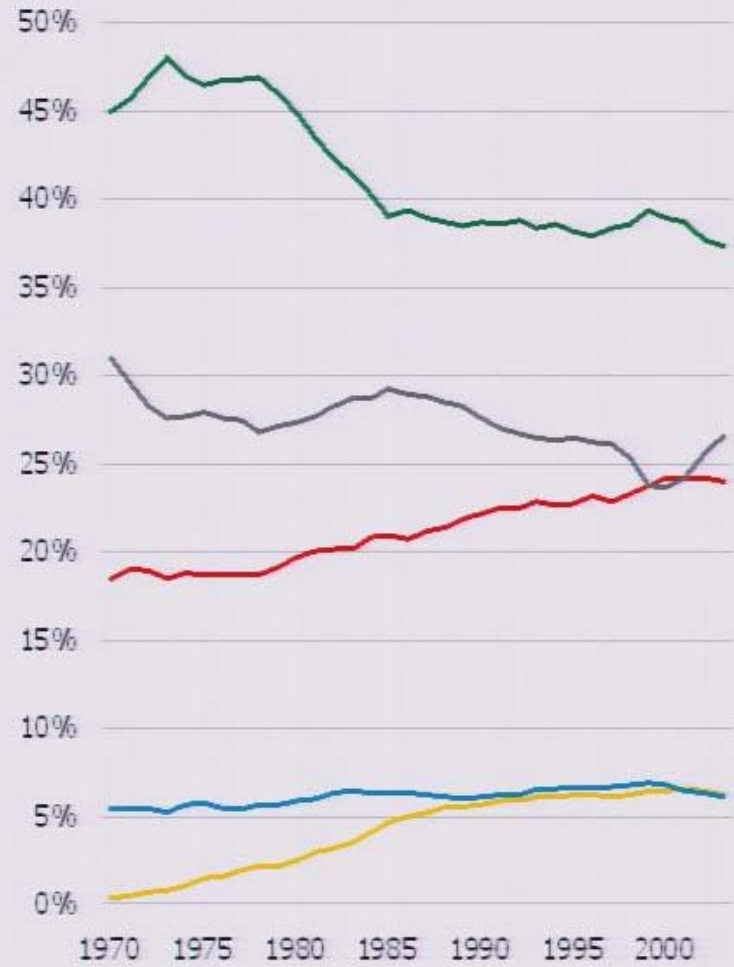
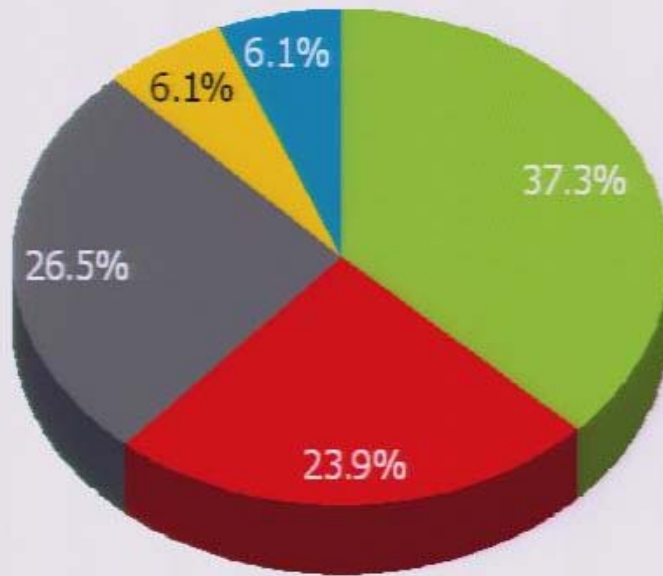
## **Future of Nuclear Power**

- **We currently have 104 commercial fission power plants in the US**
- **These produce about 20% of our total electricity**
- **The power plants produce competitively priced electricity and no greenhouse gases**
- **Several utilities are seriously considering building a new plant (first since the 80's) in the US**
- **New plants are being built or planned in Finland, China, Korea, etc.**

# US Electricity Production by Type



Current global energy supply is dominated by fossil fuels – oil has been the largest component of the energy mix for many decades; gas has grown strongly since the 1970's; coal has been growing in the last four years; hydro is constant and nuclear has plateaued



Source: BP Statistical Review

## **Where are jobs?**

- **Utilities (supporting reactors)**
- **Vendors (designing and building reactors)**
- **Medical Physics (treatment, therapy, diagnosis)**
- **National Labs (fission, fusion, weapons, nanotechnology, etc.)**
- **Universities (research/teaching)**

## **Our Reactor**

- **We have a 1 MW nuclear reactor in the ME building**
- **We train undergraduate students to help run the reactor (as licensed operators)**
- **Commercial plants produce more like 2-3 GW of thermal power**
- **Reactor is used for training and for various research projects**
  - **Imaging**
  - **Activation analysis**
  - **Isotope production**

## **American Nuclear Society**

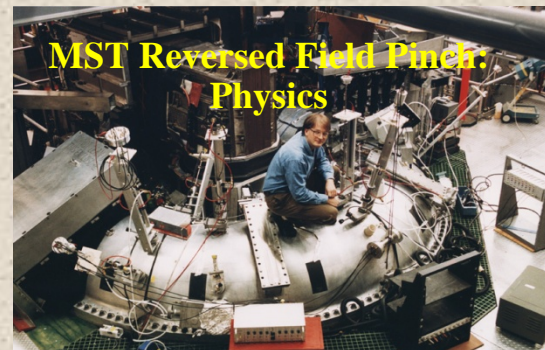
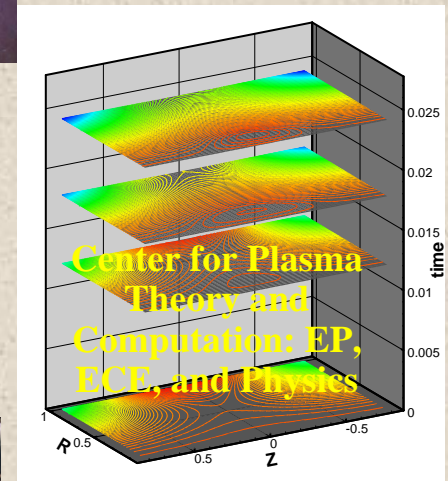
- **Our student chapter is very active**
  - **Excellent job contacts**
  - **Many attend national meetings (twice per year)**
  - **Active in outreach statewide**

# UW conducts an impressive array of plasma science research activities, with EP playing a central role.



**Also:**

- **National Collaborations: Experiment and Theory**
- **New facilities in Eng.Phys.**



**For more information:**

**<http://www.engr.wisc.edu/ep>**