ENERGY AND ENVIRONMENT CONCENTRATION

DEPARTMENT OF MECHANICAL ENGINEERING
UNIVERSITY OF WASHINGTON

Purpose

IMPORTANT CHANGES in the use of energy by humankind are likely to occur over the careers of today's engineering students. New technologies for efficiently and cleanly converting primary energy sources (such as natural gas and solar) to the forms of energy used (such as electricity) are constantly evolving and are in high demand by society. With this in mind, a curriculum of energy courses available at the University of Washington has been developed, bringing together the wealth of knowledge in this diverse subject that is found across the campus.

Energy & Environment

JOINTLY STUDYING energy and its environmental consequences is very important. The energy resources we use and the energy conversion technologies that gain significant market-share will be increasingly determined by their environmental impacts and environmental policies and regulations, both regional and global. The courses listed cover a wide range, from energy conversion principles to design for energy and environment.

Opportunities

THE ENGINEER interested in energy can become involved in advanced technology development, energy systems engineering, energy applications engineering, energy consulting, energy planning, and energy policy development. Several types of employment opportunity exist in the Pacific Northwest and western US and Canada for engineers with education and training in energy and control of the environmental impacts of energy. Opportunities exist at:

- The national research laboratories.
- Government agencies.
- Utilities and independent power producers.
- Technology companies involved in advanced reaction and combustion engineering, advanced energy systems development, fuel cell development, wind turbine development, and solar energy development.
- Companies involved in engineering design and installation of energy and environmental control systems, including system upgrading and retrofitting.
- Manufacturing companies that produce energy conversion equipment, and manufacturers that consume large amounts of energy.
- Energy resource companies.

SINCE each of us in the USA and Canada is continuously responsible for about 12 kilowatts of power, and since the pressure is growing to improve the efficiency and cleanliness of energy generation and consumption, the opportunities for the energy engineer look promising.

Courses

THE ENERGY COURSES are divided into two categories: 1) Primary Courses consisting of energy courses offered by the ME Department, and 2) Supporting Courses mainly offered by departments other than ME in the College of Engineering and by the College of Arts and Sciences and the College of Architecture and Urban Planning. The courses listed offer the student both breadth and depth in energy and the environmental consequences of energy. However, the electrical engineering aspects of energy, including electrical generators and motors, electricity transmission and distribution networks, and semiconductors, are not covered by the courses listed. The electrical engineering courses relevant to energy carry a number of prerequisites. Thus, the student interested in such courses should contact the EE Department for advising.

THE TWO TABLES attached show the courses by number/title and by their main topics. Most of the courses are offered once each year in the quarters listed by the instructors. An exception is ME 424/ME 426. Only one of these courses is offered per year. Seniors in ME, CHEM E, and A&A are likely to have the backgrounds necessary to take most of the courses, though it is always helpful to plan ahead regarding prerequisites. Typically, two courses in thermodynamics and one course in fluid mechanics are adequate preparation. Students should check with the instructors of the non-ME courses listed in the Supporting Courses table about course preparation and confirmation of the quarter scheduled.

IN ORDER TO gain a good understanding of energy and its environmental consequences, it is recommended students take five (5) of the courses listed, including at least three (3) of the Primary Courses, and at least one (1) of the Supporting Courses.

EDUCATION in engineering economics is also recommended, since most problem solving and decision-making in energy and environmental control involve careful consideration of costs. The Industrial Engineering Department offers a course on engineering economics, IND E 250 (4), AWSp.

COURSES FOR GRADUATE STUDENTS are also available in Energy and Environment, including the 400-level courses listed in the two tables, as well as 500-level courses offered in several departments: ME, A&A, CHEM E, CEE, EE, ATMS, and PBAF.

FOR MORE information, please contact:

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ENERGY AND ENVIRONMENT COURSE MATRIX*

PRIMARY COURSES (The main focuses of each course are indicated by the filled-in boxes.)	ENERGY CONSUMPTION AND PRODUCTION TRENDS	ENERGY CONVERSION PRINCIPLES & TECHNOLOGIES	ENERGY RESOURCES	ENVIR. IMPACTS OF ENERGY, CONTROL AND MITIGATION	FOSSIL ENERGY	COMBUSTION AND HEAT ENGINES	NUCLEAR ENERGY	FUEL CELLS	RENEWABLE ENERGY: SOLAR, WIND, HYDRO, TIDAL, WAVE, BIOMASS, GEOTHERMAL	ENERGY FOR THE BUILT ENVIRONMENT	DESIGN FOR ENERGY AND ENVIRONMENT
ME 341 (3, A) (Malte) Energy & Environment I – Fossil / Nuclear	■	■	■	■	■		■				
ME 342 (3, W) (Malte) Energy & Environment II --Renewable		■	■						■	■	
ME 415 (3, W) (Cooper) Sustainability & Design for Environment				■							■
ME 424 (4, Sp-even) (Malte) Combustion Systems & Pollutant Formation		■		■		■					
ME 426 (4, Sp-odd) (Malte) Sustainable Energy Design									■		■
ME 430 (4, W) (Kramlich) Advanced Energy Conversion		■			■	■	■	■			
Supporting Courses											
CHEM E 445 (3, Sp) (Stuve) Fuel Cell Engineering		■						■			
ME 425 (4, Sp) (Elder) HVAC Engineering		■								■	■
ARCH 431 (3, AW) (Heerwagen) Environmental Control Principles										■	■
CEE 480 (3, W or Sp) (Larson) Air Quality Modeling				■							
CEE 490 (4, A) (Pilat/Larson) Air-Pollutant Control				■							
CHEM 458 (4, A) (Gammon) Atmospheric Global Chemistry				■							
ESS 385 (3, W) (Cheney) Fuel and Mineral Resources	■		■	■							
The following two CEE courses provide background for studying hydro energy											
CEE 345 (4, Sp) (Yeh) Hydraulic Engineering											■
CEE 476 (3, A) (Burges) Physical Hydrology			■								

*The ME Department permits up to 3-credits of 300-level ME course work or 3-credits of non-ME engineering 300- or 400-level course work to count for ME Option credit.