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| Department of Chemical Engineering | |
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| **Energy &Enivironment (64235)** | |
| **Total Credits** | **3** |
| **major compulsory** | |
| **Prerequisites** | P1 : General Chemistry I (23101) |

**Course Contents**

Introduction to conventional and alternative energy sources, basic environmental concepts, environmental impact assessment (EIA) of energy sources, Statistical Review of World Energy, air pollution in transportation and energy use, global warming and ozone depletion, waste heat, nuclear energy and its environmental impacts.

| | Intended Learning Outcomes (ILO's) | Student Outcomes (SO's) | Contribution |
|---|---|---|---|
| 1 | Apply the knowledge of science and energy engineering basics to understand the generation and usage of energy. | A | 20 % |
| 2 | Understand ethical aspects and society impact of energy and environment. | F | 10 % |
| 3 | Improving students skills in written and oral communication | G | 10 % |
| 4 | Identify and Analyze local and global social, economical and political impact of energy and environmental issues. | J | 20 % |
| 5 | Recognize students with a variety of informational and educational media of energy and environment such as traditional textbooks, scientific and technical journals. | I | 10 % |
| 6 | Judge the impact of energy usage and energy generation methods on the environment. | H | 30 % |

**Textbook and/ or Refrences**

Text Book: R. A. Ristinen, J. J. Kraushaar, Energy and Environment (2nd Edition); Wiley.; ISBN: 978-0-471-73989-0. References: Hinrichs, R.A., &Kleinbach, M.H. (2006). Energy: Its Use and the Environment, 4th Edition. Pacific Grove, CA: Brooks/Cole. Reza Toossi (2008), Energy and the Environment: Sources, Technologies, and Impacts, ISBN 978-1-4276-1867-2

| Assessment Criteria | Percent (%) |
|---|---|
| First Exam | 20 % |
| Second Exam | 20 % |
| Projects | 20 % |
| Final Exam | 40 % |

**Course Plan**

| Week | Topic |
|---|---|
| 1 | Fundamentals of Energy (Chapter 1-text book and other references) Introduction, Energy Basics, Units of Energy, The principle of Energy Conservation, Transformation of energy from one form to another and Renewable energy and non-renewable energy. Performing Energy Calculations |
| 2 | The Fossil Fuels: (Chapter 2-text book and other references) Introduction, Petroleum, Petroleum Refining, Crude Oil, Natural Gas, Coal, Oil Shale, Tar Sand. Solving problems and energy calculations. |
| 3-5 | Renewable Energy Sources: (Chapter 4 and 5- text book and other references) Introduction, Energy from the Sun, Flat plate collector system, Passive solar, Solar thermal electric power generation, Direct conversion of solar energy to electrical energy. |

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| | Hydropower, Wind Power, Ocean Thermal Energy Conversion, Biomass, Tidal Energy and Geothermal Energy. First Exam |
| 6 | Nuclear Energy and its Environmental Impacts: (Chapter 6- text Book and other References ) Introduction, Nuclear Reactors, Nuclear Fuel Cycles, Radioactive waste and its releases. |
| 7 | Statistical Review of World Energy: (Chapter 2-text book and other references) Crude Oil Resources and Consumption, Natural Gas Resources and Consumption and Coal Resources and Consumption. |
| 8 | Basic Environment Concepts: (Various References) |
| 10-11 | Global Warming ( Chapter 10- text book and other references) Introduction, Ozone Depletion, Green House Effect, Climate Change, Thermal Pollution and its Ecological Effects. |
| 12 | Environmental Impacts of Renewable Energies ( Various References) Environmental Impacts of Solar Cells, Wind Energy, Hydropower, Geothermal Energy and Biomass Energy. Second Exam |
| 13 | Energy Conservation and Environment: (Chapter 7- text Book and other References ) Introduction, Practical Ways to Protect The Environment By Conserving Energy, thus Reducing The Net Amount Of Energy Generation, House Isolation, Air Conditioning and Heat Pumps, Lighting, Water Heating, etc. |
| 14-15 | Environment Impact Assessment (EIA) of Energy Sources: ( Various References) The Concept of EIA and How to Perform Them, How to Consider All Phases Of Energy Generation, Use, and Waste in Doing a Cradle to- Grave Assessment. |
| 16 | Discussion Student projects Final Exam |