2020-2021 Fall semester
Information for
ENS-315 Energy (Online)
(tentative)

**Class hours:** Monday, 8:40-10:30
Tuesday, 9:40-10:30

**Zoom link:** [https://sabanciuniv.zoom.us/j/93443846972](https://sabanciuniv.zoom.us/j/93443846972)

**Instructor:** İsmet İ. Kaya, Office: FENS-1024, Phone: 9591
Office hour: Tuesday, 13:40, by appointment in Zoom:
[https://sabanciuniv.zoom.us/j/94210904730](https://sabanciuniv.zoom.us/j/94210904730)

**TA:** Ece Kurt
Office hour: to be determined

**References:**

- **Sustainable Energy — without the hot air**
  David JC MacKay
  Free e-book available in the web.

- **Energy, Physics and the environment**
  Cangage Learning, 2007

**Quizzes:**

Unscheduled quizzes during the lectures via SuCourse.

**HW Problem Solving:**

Exercises and problems from McFarland will be announced at SUCourse. You should submit your assignments at SUCourse within the given deadline.

**HW: Reading Assignments:**

Starting from Week-2 you will be given reading assignments approximately every week. You are expected to read the article, summarize it and provide your own reflections. Instructions will be given for each assignment.

**Exams:**

There will be 2 Mid-Term and a Final Exam. MT exam weeks are displayed in the weekly schedule below.

**Grading:**

10% Quiz + 10% HW/PS + 20% HW/RA+ 20% MT1+ 20% MT2 + 20% Final
<table>
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<tr>
<th>Academic Week</th>
<th>Topic</th>
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| 1             | **Introduction to the course:** Energy fundamentals; definitions.  
**Introduction to Physics of Energy:** Energy and Power; forms of energy and conversions; efficiency; units. |
| 2             | **Growth and Sustainability:**  
Growth patterns; critical resources; historical development; future scenarios. |
| 2, 3, 4       | **Fossil Fuels:**  
Fossil fuel formation theories; exploration and production technologies; reserves and resources; transportation of fossil fuels.  
Reserve estimation and Hubbert theory; world fossil fuel reserves; future of fossil fuels.  
Impact of fossil fuels on the environment, air pollution and its control; global warming.  
*First Mid-Term Exam* |
| 5, 6          | **Thermal Energy:**  
Heat transfer; laws of thermodynamics; heat engines and heat pumps. |
| 7             | **Electricity:**  
Introduction to electricity Ohm’s Law and analysis of simple circuits; batteries; fuel cells, motors; generators; transformers. Transmission and distribution of electricity, energy storage systems. |
| 8, 9          | **Solar Energy:**  
Solar to Heat conversion; Solar incidence power and spectrum; Passive and active solar systems.  
Principles of photovoltaics, PV technologies; PV cost vs efficiency; trends; solar thermal electric generation.  
*Second Mid-Term Exam* |
| 10, 11, 12    | **Other Renewables:**  
Impact of use of renewables: prospects on the distribution and storage.  
Wind energy: Wind power capacity; wind turbines and systems; trends.  
Hydropower: Capacity; systems; trends.  
Geothermal energy: Its origin and capacity analysis; hydrothermal systems; hot dry rock; low-temperature geothermal systems.  
Biomass energy: Renewability analysis; biomass conversion technologies. |
| 13, 14        | **Nuclear energy:**  
Fundamentals of nuclear physics; binding energy; fission and fusion; radioactivity.  
Generation of nuclear power: Fission reactors; fuel production; Nuclear waste management; Safety and risk assessment.  
Future of nuclear energy; New reactor designs; Fusion power project. |