

**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>

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

TA: **Ece Kurt**
Office hour: Thursday, 14:40-15:30, by appointment **in Zoom:**
<https://sabanciuniv.zoom.us/j/92193580309?pwd=YmJXUUNhV3J3WGgvNWFvS1pDQmpLZz09>

References:

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

Energy, Physics and the environment
Ernie L. McFarland, James L. Hunt, John L. Campbell; 3rd edition.
Cengage Learning, 2007

Quizzes:

Unscheduled quizzes during the lectures via SuCourse.

HW Problem Solving:

Exercises and problems mostly 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

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