2021-2022 Fall semester
Information for
ENS-315 Energy (Hybrid Course)
(tentative)

Class hours:  Tuesday, 13:40-14:30
    Thursday, 10:40-12:30
Zoom link:  https://sabanciuniv.zoom.us/j/98600264393

Instructor:  İsmet İ. Kaya, Office: FENS-1024, Phone: 9591
    Office hour: Thursday, 13:40-14:30, by appointment in Zoom:
        Lecture link above

TA:  Ece Kurt
    Office hour: schedule to be determined later, by appointment in Zoom:
        will be given here

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 Tophat or SuCourse.

HW- Problem Solving
Weekly exercises and problems will be announced and to be submitted at SuCourse.

HW- Writing Assignment
You are expected to write an article within the scope of the course on a topic you will select
yourself. The article should be 2,000-3,000 words in length, and include an excellent set of
scholar and non-scholar references. Detailed instructions will be given later.

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

Grading:
10% Quizzes + 10% HW/PS + 20% HW/WA+ 20% MT1+ 20% MT2 + 20% Final

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>85-100</td>
</tr>
<tr>
<td>A-</td>
<td>80-84</td>
</tr>
<tr>
<td>B+</td>
<td>75-79</td>
</tr>
<tr>
<td>B</td>
<td>70-74</td>
</tr>
<tr>
<td>B-</td>
<td>65-69</td>
</tr>
<tr>
<td>C+</td>
<td>60-64</td>
</tr>
<tr>
<td>C</td>
<td>55-59</td>
</tr>
<tr>
<td>C-</td>
<td>50-54</td>
</tr>
<tr>
<td>D+</td>
<td>45-49</td>
</tr>
<tr>
<td>D</td>
<td>40-44</td>
</tr>
<tr>
<td>F</td>
<td>0-39</td>
</tr>
<tr>
<td>Academic Week</td>
<td>Topic</td>
</tr>
<tr>
<td>---------------</td>
<td>-------</td>
</tr>
</tbody>
</table>
| 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. |