

Universidad San Francisco de Quito
College of Sciences and Engineering
Mechanical Engineering
IME-5081E: Renewable Energy Resources (3 Credits)

Second Semester 2019-2020
Syllabus

Course Description

The course imparts general knowledge of the use of energy resources in general and the role of renewable energy resources in particular.

The different resources of renewable energy (wind, solar, geothermal, biomass, oceanic, etc.) are analyzed, both the current state of the technologies and their possible energy contribution in a system.

The general economic aspects of these sources are also reviewed.

General Objective of the Course

Know the basic principles of operation several renewable energy resources systems:

- Wind
- Solar
- Biomass and biofuels
- Marine
- Geothermal
- Hydroelectric
- Energy efficiency

Specific Objectives of the Course

Be aware of the potential usage of each type of energy source.

Know the basic methodology to make an objective evaluation of the use of different sources.

Apply the basic concepts in the solution of engineering problems related to renewable energy applications.

Be able to acquire new knowledge and develop skills in practical situations, related to the technical applications of the subject.

Be able to explore new and more advanced knowledge related to renewable energy independently.

ABET Student Outcomes address by this course

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Prerequisite

Thermodynamic I
English Level 6

Lecture Hours

Section 1
Monday and Wednesdays
13:00 – 14:20

Classroom

Hayek HS400D

Instructors

David Escudero PhD.
Hayek 343
Email: descudero@usfq.edu.ec

Juan Sebastián Proaño, Ph.D.
Maxwell 308
Email: jsproano@usfq.edu.ec

Recommended Literature

Vanek Francis, Albright Louis, Angenent Largus. (2016). Energy Systems Engineering: Evaluation and Implementation, 3rd Edition, McGraw Hill.

Boyle Godfrey, (2012) Renewable energy, 3rd Edition; Oxford University Press

Brown, R. C., & Brown, T. R. (2013). Biorenewable resources: engineering new products from agriculture. John Wiley & Sons.

Brown, R. C., & Brown, T. R. (2012). Why are we producing biofuels. Brownia LLC, Ames.

Hester, R. E., & Harrison, R. M. (Eds.). (2003). Sustainability and environmental impact of renewable energy sources (Vol. 19). Royal Society of Chemistry.

Singh, A., Pant, D., & Olsen, S. I. (Eds.). (2013). Life cycle assessment of renewable energy sources. Springer Science & Business Media.

Kaltschmitt, M. (2013), Renewable Energy Systems, Springer References

D2L

- The course material will be distributed in its entirety through D2L.
- Frequently check the course page in D2L to obtain the most up-to-date information.

General Policies of the Course

- Class attendance is required.
- Turn off cell phones for the duration of the class.
- The Honor Code of the USFQ regarding academic dishonesty and plagiarism will be strictly respected.

Course Evaluation

- Group Presentations: 15%
- Quizzes (6): 20%
- Midterm Exam: 20%
- Final Exam: 20%
- Project: 25%

Grading

<i>Range</i>	<i>Grade</i>
91-100	A
81-90.99	B
71-80.99	C
61-70.99	D
< 69.99	F

Group Presentations

The group presentations will be made in a group of 4 students. They will be assigned to read a paper with a topic relevant to the content of the class. The students will have to prepare a presentation of 15 to 20 minutes in which they explain the topic they read and transmit this knowledge to the rest of their classmates.

The grade will be based on the quality of the presentation and how well the students communicate ideas to the rest of the classmates.

Final Project

The final project will be carried out in a group of 4 people. During the first weeks of the semester the groups for the project will be determined. Each group is responsible for proposing a project topic after the fourth week of class.

The project will be presented at the Mechanical Engineering Fair at the end of the semester.

Tentative Schedule

Week	Date	Topic
1	13/01/2020 15/01/2020	Intro and global and local energy consumption
2	20/01/2020 22/01/2020	System Tools for Energy Systems; Economic Tools for Energy Systems
3	27/01/2020 29/01/2020	System and Economic Tools for Energy Systems; Climate Change. Group 1 Presentation.
4	3/02/2020 5/02/2020	Quiz 1. Fossil Fuel Resources; LCA
5	10/02/2020 12/02/2020	The solar resource; Solar Photovoltaic Technologies. Group 2 Presentation.
6	17/02/2020 19/02/2020	Solar Thermal Applications. Quiz 2
7	24/02/2020 26/02/2020	Midterm Holiday, No Classes
8	2/03/2020 4/03/2020	Midterm Exam Wind Energy Systems. Group 3 Presentation.
9	9/03/2020 11/03/2020	Wind Energy Systems. Ocean Energy. Quiz 3
10	16/03/2020 18/03/2020	Ocean Energy; Geothermal Resource. Group 4 Presentation.
11	23/03/2020 25/03/2020	Quiz 4. Hydroelectric power. Group 5 Presentation.
12	30/03/2020 1/04/2020	Bioenergy Resource and Systems. Group 6 Presentation.
13	6/04/2020 8/04/2020	Bioenergy Resource and Systems Transportation Energy Technologies. Quiz 5
14	13/04/2020 15/04/2020	Transportation Energy Technologies. Energy Efficiency ISO 50001. Group 7 Presentation
15	20/04/2020 22/04/2020	Group 8 Presentation. Projects pre presentations
16	27/04/2020 29/04/2020	Group 9 Presentation. Energy Efficiency and ISO 50001; Integrations of multiple energy resources – Smartgrid. Quiz 6
17	4/05/2020 11/05/2020	Final Exam

* This calendar is subjected to changes

USFQ Mission Statement

USFQ prepares, educates, investigates, and serves the community within the philosophy of Liberal Arts integrating all segments of the society.

USFQ Vision Statement

USFQ will be a model University in Liberal Arts education, entrepreneurship, and scientific, technological and cultural development of Latin America, recognized by the quality and leadership of its graduates.

Liberal Arts

An educational philosophy in which all disciplines of knowledge are equally important and seeks to form individuals, aware of their surroundings, self-confident, creative, entrepreneurs, and free.

USFQ-Mechanical Engineering Department-Mission Statement

Our mission is to educate mechanical engineers that are leaders, entrepreneurs, creative professionals, and humanists, with solid knowledge on fundamental principles, methods, practices and tools related to the specialized area of mechanical engineering, and other close related areas. All these goals are framed within a philosophy of sustainable production.

USFQ Honor Code

- 1.- Conduct myself in a manner that won't affect the personal and/or professional execution of activities of other persons inside the university community. This means, among other actions, I will avoid: slander, lies, greed, envy; I will promote kindness, acknowledgement, happiness, friendship, solidarity and the truth.
- 2.- Be honest: I won't copy, plagiarize, lie or steal in any way. I will sign all exams in recognition of the Code of Honor, stating that I haven't received help, nor have I copied from sources that are not allowed. I will keep all tests, exams and other information to myself, without disclosure.
- 3.- Respect and take care of the campus. This means all the physical things that make it up, and all its equipment.
- 4.- Not to defame or accuse.
- 5.- Report all actions from any member who does not respect the Code of Honor to the Dean of Students and cooperate with the Court of Honor to clear up any investigation or trial that is in violation of the Code.

Any infringement to this Code will be penalized by the corresponding authority. The student has the right to analyze and defend his/her case before the Court of Honor.

For more information about USFQ's Honor Code, please see the Dean of Students

ASME Code of Ethics*The Fundamental Principles*

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

- I. using their knowledge and skill for the enhancement of human welfare;
- II. being honest and impartial, and serving with fidelity their clients (including their employers) and the public; and
- III. striving to increase the competence and prestige of the engineering profession.

The Fundamental Canons

1. Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.
2. Engineers shall perform services only in the areas of their competence; they shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
3. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional and ethical development of those engineers under their supervision.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest or the appearance of conflicts of interest.
5. Engineers shall respect the proprietary information and intellectual property rights of others, including charitable organizations and professional societies in the engineering field.
6. Engineers shall associate only with reputable persons or organizations.
7. Engineers shall issue public statements only in an objective and truthful manner and shall avoid any conduct which brings discredit upon the profession.
8. Engineers shall consider environmental impact and sustainable development in the performance of their professional duties.
9. Engineers shall not seek ethical sanction against another engineer unless there is good reason to do so under the relevant codes, policies and procedures governing that engineer's ethical conduct.
10. Engineers who are members of the Society shall endeavor to abide by the Constitution, By-Laws and Policies of the Society, and they shall disclose knowledge of any matter involving another member's alleged violation of this Code of Ethics or the Society's Conflicts of Interest Policy in a prompt, complete and truthful manner to the chair of the Ethics Committee.