Kingdom of Saudi Arabia Ministry of Higher Education Qassim University College of Engineering		المملكة العربية السعودية وزارة التعليم العالي جامعة القصيم كليه الهندسه

Energy Conservation

College: Engineering

Department: Mechanical

First: Course Definition

1- Course Code: ME674

2- Units : 3 credit hrs

3 – Semester

4 -Prerequisite : None

5- Co-requisite : None

6- Location (if not on main Campus): N/A

Second: Course Objectives

1. Give students an appreciation of the different types of energy
2. To give students an understanding of the concept of nuclear fission and types of fission reactors
3. To make students familiar with the fuel cells theory

Third: Course Specifications

1- Topics to be covered

Subject	No of Weeks	Units
Energy sources and their classification.	1	3
Conventional energy conservation: Power plant and vapor cycles.	3	9
Renewable energy: Solar energy with emphasis on solar cells, and wind energy.	4	12
Ocean thermal energy conversion "OTEC" systems.	1	3

Geothermal energy.	2	6
Nuclear fission and types of fission reactors.	2	6
Fuel cells	2	6

2- Course components (Total hrs in the Semester)

Lecture	Exercise or lab	Other	Total
45 hours	-----	None	45 hour

3- Intended Learning Outcomes of the Course (ILO's)

a. *Knowledge*

i) Description of the knowledge to be acquired:

On successful completion of this course, students should be able to:

- identify and classify the different energy sources
- recognise the conventional energy conservation plants: Power plant and vapor cycles.
- recognise the renewable energy sources and their methods of conservation
- describe nuclear fission and types of fission reactors.
- describe fuel cells

ii) Teaching strategies to be used to develop that knowledge

- Class lectures.
- Reading assignments
- Students' presentations.
- Reports.

iii) Methods of assessment of knowledge acquired

- Exams.
- Quizzes.
- Homework assignments.

b- Cognitive (Intellectual) Skills

i) Cognitive skills to be developed

On successful completion of this course, students should be able to:

- analyze the different energy sources
- differentiate between the conventional energy conservation plants
- analyze the different parameters of power plant and vapor cycles.

- distinguish between the renewable energy sources and their methods of conservation
- explain nuclear fission and types of fission reactors.
- interpret fuel cells

ii) Teaching strategies to be used to develop that these cognitive skills

- Class lectures.
- Tutorial sessions
- Case study (data collection, Internet search, and reporting)
- Problem assignments and Students' presentations.
- Reports.
- Group discussion.

iii) Methods of assessment of students cognitive skills

- Exams.
- Quizzes.
- Homework
- Assignments.

c. Interpersonal Skills and Responsibility

i) Description of the interpersonal skills and capacity to carry responsibility to be developed

On successful completion of this course, students should be able to:

- participate in class discussions with colleagues and with teachers.
- work in team
- develop ideas and share with others
- appreciate the need for energy conservation and its optimal use.
- recognize the conflicting issues between using energy and environmental issues (sustainability, diversity and pollution).

ii) Teaching strategies to be used to develop these skills

- Class lectures.
- Reading assignments and Students' presentations.
- Case study (data collection, Internet search, and reporting)
- Problem assignments and Students' presentations.
- Reports.
- Group discussion.

iii) Methods of assessment of student's interpersonal skills and capacity to carry responsibility

- Exams.
- Quizzes.
- Homework
- Assignments.

d. Communication, Information Technology and Numerical Skills

i) Description of the skills to be developed in this domain

On successful completion of this course, students should be able to:

- Use of the internet search for course related issues.
- Write acceptable technical report.
- Verbally present technical report.

ii) Teaching strategies to be used to develop these skills

- Reading assignments and Students' presentations.
- Case study (data collection, Internet search, and reporting)
- Reports.
- Group discussion.

iii) Methods of assessment of students numerical and communication skills

- Homework
- Assignments.

e. Psychomotor (if applicable) & Other Non-cognitive Skills

i) Description of the psychomotor or other skills to be developed and the level of performance required

Not Applicable

ii) Teaching strategies to be used to develop these skills

Not Applicable

iii) Methods of assessment of student's psychomotor skills

Not Applicable

4- Student Assessment Schedule

Serial	*Assessment tool (test, group project, examination etc.)*	*Week due*	*Weight*
1	Four quizzes	Weeks 5, 8, 10 and 14	10 %
2	Two mid-term exams	Weeks 6 and 12	20 %
3	Mostly Eight Assignments (in-class/out-class) and homework. This number may increases according to the instructor view.	Weeks 2, 3, 5, 7, 9, 11, 13 and 15	16 %
4	Attendance	All weeks	4 %
5	Final Exam	Week 16	50%

5- Student Support

Four office hours per week are offered by the instructor to aid the students and support them.
University data base access (electronic library of textbooks and scientific periodicals)

6- Learning Resources

i) Essential Books (References)

- W. Culp, Principles of Energy Conversion, McGraw-Hill Company, 1991.
- H. Sorensen, Energy Conversion Systems, John Wiley & Sons, 1990.

ii) Course Notes

None

iii) Recommended Books

- Alireza Khaligh and Omer C. Onar, Energy Harvesting: Solar, Wind, and Ocean Energy Conversion Systems, PRC Press, 2009.
- D. Yogi Goswami and Frank Kreith, Energy Conversion, Taylor and Francis(CRC Press), 2007.
- D Yogi Goswami, Frank Kreith, Jan F Kreider, Principles of Sustainable Energy, Taylor Francis Inc, 2010.

iv) Electronic Books & Web Sites:

- Weston, Kenneth C., Energy Conversion, electronic edition; revised from the 1992 edition, http://onlinebooks.library.upenn.edu/webbin/book/lookupid?key=olbp33597

v) Periodicals

- Energy Conversion and Management - Elsevier
- International Journal of Power and Energy Conversion (IJPEC)
- Renewable Energy - Elsevier
- Journal of Renewable and Sustainable Energy
- Journal of Nuclear Energy
- Journal of Fuel Cell Science and Technology

7- Course Evaluation and Improvement Processes

i) Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Students questionnaires,
- Appeal box

ii) Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Instructor course evaluation report by the end of the course
- Periodical (semester/annual) review of the department subject committee

iii) Processes for Improvement of Teaching

- The educational continuous improvement process which applied in the department according to the ABET criteria are also applied here, moreover
- Evaluation of the course outlines by external staff member from outside the university
- Periodical contact with the different engineering authorities and industries for evaluating and getting their feedback and suggestions concerning the course outlines.

iv) Processes for verifying standards of student

- Check marking by an independent faculty member of a sample of student work.

v) Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

According to the continuous improvement process applied in the department according to the ABET criteria there are different levels of assessments and reviews:

1) Semester review by course instructor and the department subject committee

2) Annual review by the Program Committee

The inputs for such assessments and reviews come from all stake holders for the M.Sc. and the outputs are decisions and recommendations for improvement as detailed in the documents describing the educational continuous improvement process in the department.