THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Department of Physics

PHY 512 – Energy conversion and storage

COURSE PARTICULARS

Course Code: PHY 512
Course Title: Energy conversion and storage
No. of Units: 3
Course Duration: Three hours of theory per week for 15 weeks.
Status: Compulsory
Course Email Address: phy512@gmail.com
Course Webpage: http://www.fwt.futa.edu.ng/courseschedule.php?coursecode=PHY%20204
Prerequisite: NIL

COURSE INSTRUCTORS

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COURSE DESCRIPTION

This course is designed for final year students in physics to expose them to the applications of physics in energy conversion technology. It discusses the basic physics requirement in the understanding of solar energy conversion and other sources of renewable energy. The applications of thermodynamic laws and efficiency of thermal engines are also discussed. Topics to be covered include Fossil fuels, Nuclear power, Renewable energy: solar energy, solar photovoltaic electricity, hydroelectric power, tidal power, Biomass and biofuels, Geothermal power.

COURSE OBJECTIVES

The objectives of this course are to:

- introduce students to various forms of energy: renewable and non-renewable energies.
- provide students with basic thermodynamic theory required to understand energy conversion technology.

COURSE LEARNING OUTCOMES / COMPETENCIES

Upon successful completion of this course, the student will be able to:
(Knowledge based)

- understand the basic principles of energy conversion technology.
- classify and explain the different sources of energy: renewable and non-renewable;

(Skills)

- determine the amount of energy that can be got from a given quantity of fossil fuel such as:
    - coal;
    - petroleum;
    - natural gas;
- appreciate the limitations/hazards associated with these sources of energy;
- understand the production of clean energy from renewable energy source such as sun;
- conduct literature search on the Internet on modern energy conversion technologies.

GRADING SYSTEM FOR THE COURSE

This course will be graded as follows:

Class Attendance	10%
Assignments	30%
Test(s)	20%
Final Examination	40%
TOTAL	**100%**

GENERAL INSTRUCTIONS

Attendance: It is expected that every student will be in class for lectures and also participate in all practical exercises. Attendance records will be kept and used to determine each person's qualification to sit for the final examination. In case of illness or other unavoidable cause of absence, the student must communicate as soon as possible with any of the instructors, indicating the reason for the absence.

Academic Integrity: Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances are prohibited. You are not allowed to make copies of another person's work and submit it as your own; that is plagiarism. All cases of academic dishonesty will be reported to the University Management for appropriate sanctions in

accordance with the guidelines for handling students' misconduct as spelt out in the Students' Handbook.

Assignments and Group Work: Students are expected to submit assignments as scheduled. Failure to submit an assignment as at when due will earn you zero for that assignment. Only under extenuating circumstances, for which a student has notified any of the instructors in advance, will late submission of assignments be permitted.

Code of Conduct in Lecture Rooms and Laboratories: Students should turn off their cell phones during lectures. Students are prohibited from engaging in other activities (such as texting, watching videos, *etc*.) during lectures. Food and drinks are not permitted in the laboratories.

READING LIST

[1]Boyle, G., ed., Renewable Energy: Power for a sustainable future. Oxford University press, 1996.

[4]Elliott, D., Energy, Society, and Environment: Technology for a sustainable future. London; Routledge, 1997.

[3]Masters, G. M., Introduction to Environmental Engineering and Science. Prentice-Hall: New Jersey 1991.

Web sites

Energy efficiency and renewable energy network, US Department of Energy:

http//www.ise.thg.de

Solar energy and renewable energy-related servers:

http//www.catarg.uk

Legend
1- Available in the University Library
2- Available in Departmental/School Libraries
3- Available on the Internet.
4- Available as Personal Collection
5- Available in local bookshops.

COURSE OUTLINE

Week	Topic	Remarks
1	Introduction and Course Overview Theory of modern energy conversion	During this first class, the expectation of the students from the course will also be documented.
2 & 3	Theory modern energy conversion, transmission, and storage method.	Basic theory of thermodynamics and fluid mechanics will be revised.
4 & 5	Non renewable energy sources: • Fossil fuels • Nuclear power • Nuclear fission • Nuclear reactors • Nuclear fusion	Calculations involving quantity of energy that are obtainable from fossil fuels will be included.
6	Renewable energy * solar energy * photoelectron converters	Practical applications of solar panels and collectors will be discussed. Exercises on numerical calculations of quantity of energy obtainable from these sources will be given.
7 & 8	• solar photovoltaic electricity • Hydroelectric power • Windmills	Students will be requested to prepare present term paper on different sources of energy. MID-SEMESTER TEST
9 & 10	• Heat engines • Classical engines	Students will be divided into groups and given relevant topics to prepare and present at seminars.

11 & 12	Classical engines Ocean thermal energy converters • Tidal power • Wave energy • Geothermal energy	Students will be divided into groups and given relevant topics to prepare and present at seminars.
13 & 14	Biomass and biofuels • Photothermovoltaic converters • photosynthesis • production of methanol and ethanol from vegetable matter	Students will be taught the production and applications of biofuels.
15	REVISION	This is the week preceding the final examination. At this time, evaluation will be done to assess how far the students' expectations for the course have been met.