新能源技术

Renewable Energy

I. **Course Code:**

Class Hour: 32 Credit: ____ Semester： 1

(Classroom Hour： 28 ; Practice Hour： 4)

II. **Suitable specialty：**

Mechanical Engineering and Electrical engineering student

III. **Prerequisites:**

A sound grasp of the concepts covered in Power Engineering as well as Mathematical Methods and Control are required and assumed as prior knowledge.

IV. **Course Description and course target**

This course introduces students to contemporary renewable energy technologies, including sustainability and environmental issues, energy resources, electric power generation from renewable energy sources, such as solar, wind, geothermal, wave, tide, hydro and fuel cells. This course provides understanding of energy storage and system integration and, as an example, developments in electrical utilization in electric and hybrid vehicles is included in the course.

The course allows students to discuss the design techniques for renewable energy systems in detail and practice their design skills of renewable energy systems through assignments that include system specification, analysis of options and system design. In this course, students gain knowledge and essential skills to design a renewable energy system. The course provides knowledge on the application of various aspects of renewable energy sources, generation, and application.This course introduces students to contemporary renewable energy technologies, including sustainability and environmental issues, energy resources, electric power generation from renewable energy sources, such as solar, wind, geothermal, wave, tide, hydro and fuel cells. This course provides understanding of energy storage and system integration and, as an example, developments in electrical utilization in electric and hybrid vehicles is included in the course.

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V. **Teaching method:**

Lectures: A study guide schedule brief will be provided highlighting what is expected to be covered by students per week. Students are then expected to engage with the material from the text book and relevant sources. Lectures will be used to address specific material based on students queries, challenges and need. There will be short recorded lecture material to address specific material of the course.
Tutorials: The tutorial arrangements can be made during lectures.
Project: The deadline for the course project will be posted on the course home page. The School's policy on timely submission of project.
Laboratory equivalent assignments (this could include quizzes): There will not be any physical laboratory work, however experimental data and an assignment can be used to complement the physical laboratory work. More information will be provided through lectures slot and course home page.
Consultation: Special times may be arranged in the lectures on request. However, the lecture slots should be used by students to address specific issues.

VI. **Course content**

1. Fundamentals of renewable energy sources 4 Class
    - 1.1 Concept of Renewable Energy
    - 1.2 Renewable Energy Resources
2. PV generation 4 Class
    - 2.1 PV Generation Concept
    - 2.2 PV Generation Technologies
    - 2.3 PV Generation Applications
3. Wind generation 4 Class
    - 3.1 Wind Generation Concept
    - 3.2 Wind Generation Technologies
    - 3.3 Wind Generation Applications
4. Hydroelectric generation 4 Class
    - 4.1 Hydroelectric Generation Concept
    - 4.2 Hydroelectric Generation Technologies
    - 4.3 Hydroelectric Generation Applications
5. Other renewable energy sources - marine, thermo-electric, etc 4 Class
    - 5.1 marine Generation
    - 5.2 thermo-electric Generation
    - 5.3 Other Power Generation
6. Energy storage and smart grids 4 Class
    - 6.1 Battery
    - 6.2 Flywheel
    - 6.3 Smart Grid
7. Renewable energy business cases 4 Class
    - 7.1 Economy analysis
    - 7.2 Business cases study
8. Applications - electric vehicles 4 Class
    - 8.1 EV-Charging Station-Energy Storage integration

8.2 Vehicle to Grid
8.3 Transportation Electrification with Renewable Energy

VII. **Grading:**

Exam or equivalent assignment: 40%

Group Design Project: 40%

Computer lab or individual assessment: 20%

Note that the exam requires a sub-minimum of 35% in order to pass the course. That means even if the average mark of the course is above 50% and you obtained less than 35% for the exam, you will not have satisfied the requirements to pass the course.

VIII. **References**

Textbook: There is no set textbook. There will be notes on certain materials of the course that can act as supplementary material. Other references listed below can be used to enhance deeper understanding. Renewable energy is a rapidly changing subject so up-to-date on-line resources will be the best source of information.

Other References

- M. R. Patel, 'Wind and Solar Power Systems', Taylor & Francis Group, 2006.
- J. Twidell and T. Weir, "Renewable Energy Resources", 2nd Ed., Taylor & Francis, 2006.
- John Andrews and Nick Jelley, "Energy Science – Principles, Technologies, and Impacts", Oxford University Press, 2007.
- J. F. Manwell, J. G. McGowan, and A. L. Rogers, "Wind Energy Explained – Theory, design and application", John Wiley & Sons Ltd 2002

IX. **Syllabus written by：**

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