Department Contact Information:

- **Start Date:** 24-SEP-2018
- **College:** A
- **Department:** PAPR

Initiator name: Qinlong Wu

Department email: qinlong.wu@wmich.edu

Proposed effective term: 201940

Does course need General Education approval? N

Will course be used in teacher education? Y

If 5000 level course, prerequisites apply to:

- B
  - New Course CHEG 5200
  - New course selected: This new course is not seeking approval as a general education course.

1. Proposed course prefix and number: CHEG 5200
2. Proposed credit hours: 3
3. Proposed course title: RENEWABLE ENERGY AND ENERGY STORAGE
5. Proposed course corequisites: none
6. Proposed course prerequisites that may be taken concurrently (before or at the same time): none
7. Minimum grade for prerequisites (default grades are D for Undergrad and C for Grad): C
8. Major and/or minor restrictions: Not Applicable
9. List all the four-digit major and/or minor codes (from Banner) that are to be included or excluded: none
10. Classification restrictions: Not Applicable
11. List all the classifications (freshman, sophomore, junior, senior) that are to be included or excluded: SR
12. Level restriction: Not Applicable
13. List the level (undergraduate, graduate) that is to be included or excluded: Not Applicable
14. Do prerequisites and corequisites for 5000-level courses apply to undergraduates, graduates, or both? Both
15. Is this a multi-topic course? No
16. Proposed course title to be entered in Banner: Renewable Energy and Storage
18. Is this course mandatory/credit/no credit?
Yes

19. Select class type:
Lecture

20. How many contact hours per week for this course?
4

A. Please choose Yes or No to indicate if this class is a Teacher Education class:
Yes

B. Please choose the applicable class level:
Both

C. Please choose Yes or No to indicate if this class is a General Education class:
No

D. Explain briefly and clearly the proposed improvement.
New course

E. Rationale. Give your reason(s) for the proposed improvement. (If your proposal includes prerequisites, justify those, too.).
This course will train students and enable them to acquire and apply the fundamental knowledge from thermodynamics and general physics and state-of-the-art technologies to renewable energy and energy storage.

F. List the student learning outcomes for the proposed course or the revised or proposed major, minor, or concentration. These are the outcomes that the department will use for future assessments of the course or program.
This course contributes to meet the following criteria for student outcomes.
a) An ability to apply knowledge of mathematics, science, and engineering: Formulate and solve mathematical equations related to solar cell, fuel cell, capacitor and battery.
b) An ability to function on multidisciplinary teams: Perform as a

Department Curriculum Chair approver: Said Abubakr
Date: 26-SEP-2018
Comment:
Chair approver: Kecheng Li
Date: 27-SEP-2018
Comment:

* Curriculum Committee Approval
- [ ] Approve
- [ ] Deny

Reason for denial:

Comment:

Enter Proposal number only if approved:
Proposal Number: [ insertion ]

Complete Save & Close Cancel

Attachments

Attach File
Course Syllabus

1. Course number and name: CHEG 5200 – Renewable Energy and Energy Storage

2. Credits and contact hours: 3 credits, 4 contact hours per week

3. Instructor’s or course coordinator’s name: Dr. Qingliu Wu

4. Text book, title, author, and year: None. Various materials will be used.

5. Specific course information
   a. Catalog description: This course covers the basic concepts of energy, energy conversion and energy storage with emphasis on renewable energy and rechargeable battery. Fundamentals and state-of-the-art technologies for utilizing renewable resources for energy will be introduced. Theories, processes and applications of energy conversion and storage technologies, including electric capacitors, batteries, rechargeable batteries and fuel cells, will be discussed.
   b. Prerequisites or co-requisites: Prerequisites - CHEG 3200 (Chem. Eng. Therm.), PHYS 2070 (Univ. Physics II)
   c. Required course: No.

6. Specific goals for the course
   a. Specific outcomes of instruction: Upon completion of the course, the students should be able to:
      i. Distinguish various sources of energy; Understand energy density, heating value of various fuels.
      ii. Understand biofuel production and fuel cell technologies.
      iii. Understand fundamentals of solar cells, analyze the characteristic curve, calculate the fill factor and efficiency of solar cells.
      iv. Be familiar with technologies of energy storage; Understand terminology in energy storage.
      v. Understand working principle for supercapacitors, fuel cells, lithium-ion, lithium-sulfur and lithium-air batteries.
      vi. Analyze the behaviors of electrical storage with fundamentals of electrochemistry
      vii. Be able to determine the open circuit voltage, rate capability and durability of batteries
      viii. Design batteries with high energy densities
   b. ABET Criterion 3 Outcomes addressed:
      i. (3a) An ability to apply knowledge of mathematics, science, and engineering: Formulate and solve mathematical equations related to solar cell, fuel cell, capacitor and battery.
ii. (3d) An ability to function on multidisciplinary teams: Perform as a member/leader of a team in conducting research project and writing reports.

iii. (3e) An ability to identify, formulate and solve engineering problems: Use fundamental knowledge and state-of-art technologies to design batteries with high energy densities for practical applications.

c. Brief list of topics to be covered:
i. Introduction to Energy and Energy Forms
ii. Renewable Energy
iii. Bioethanol from Lignocellulose Biomass
iv. Energy Storage
v. Rechargeable Batteries
vi. Lithium-Ion Batteries
vii. Lithium-Sulfur Batteries
viii. Lithium-Air Batteries