



NEW COURSE OUTLINE

Departments/units should complete this form, obtain all necessary approvals and submit to their College Office to establish a new course. The outline will be reviewed by the College and forwarded to appropriate campus offices for additional approval.

All gray boxes on this form, except gray check boxes, are expandable text fields. Place your cursor in the box and start typing.

Proposed Effective Term: Fall Spring Summer – 2010

Department/Unit Name: NPRE

Department/Unit Code: 1973

1. Banner Subject and Course Number: NPRE 498
2. Course Title (limit to 30 characters): Energy Storage Systems
3. *Course Catalog* description. Limit to 150 words (include any special course requirements such as field trips, special equipment, etc., in the course description):
The major objective of this course is a comprehensive coverage of energy storage for nuclear, automotive and renewable engineering. The necessity for efficient energy storage; storage in automotive, consumer, nuclear and green industries; battery technologies including primary and secondary electrochemical cells; lead acid, nickel-based, Li-ion batteries; advanced battery systems including redox/flow batteries (vanadium, Zn/Br, polysulfide/Br), sulfur-sodium; hydrogen electrochemical cells and regenerative fuel cells including hydride storages; mechanical energy storage including flywheel, compressed-air and pumped hydraulic; thermal and chemical storage based on phase-change and medium enthalpy-change reversible chemical reactions; inductive storage based on superconducting magnetic field; social and economical aspects of storage technology, specific new developments in storage. The course project is building a rechargeable battery for a wind turbine.
4. Course prerequisites (prerequisite statements only appear in the course description and are not enforced through the Banner system):
PHYS 101-102; MATH 241; CHBE 221 or Oral Permission of Instructor
5. Is there a restricted audience for this course (do not include in prerequisite statement)?
 Yes No If yes, please specify the restrictions (e.g., For majors only): _____

COURSE JUSTIFICATION

6. **Please attach the course syllabus.** The syllabus should include basic and recommended texts (author, title, year of publication) as well as a list of the principal topics covered in this course, number of examinations, contact hours, work required of students, and basis for determining grade.

400-level: 3* undergraduate hours **and** 400-level: 4* graduate hours

Courses offered for both undergraduate and graduate credit require justification of the work required for graduate credit. Please detail the work required for graduate credit: _____

C. Graduate credit only

500-level: _____ * graduate hours

D. Professional credit only

600- and 700-level: _____ * professional hours

* For A-D, if a course is offered for varying amounts of variable credit please select one of the two options:

- This course is available for a range of credit hours (e.g., 1, 2, or 3 hours)
 This course is only available for two distinct credit-hour options (e.g., 1 or 3 hours)

14. For any course requesting variable credit, please specify the work required for the additional credit.
Graduate students are expected to complete a term paper on advanced topics for the additional credit
15. If the course is offered in the summer for a different number of credit hours, please justify the difference: _____
16. Restrictions on credit:
- A. May this course be repeated in separate semesters?
 Yes No If yes, for how many total hours? _____ undergraduate; _____ graduate
- B. May students register in this course more than once (duplicate registration) in the same term?
 Yes No If yes, for how many total hours? _____ undergraduate; _____ graduate
- C. Are there any other credit restrictions?
 Yes No If yes, please specify the restrictions (e.g., for MATH 221: Credit is not given for both MATH 221 and MATH 220): _____
17. Grading Type:
 Letter grade
 S/U (Any course offered for zero hours of graded credit must include S/U grade mode.)
 Both
 DFR If DFR is selected, please justify the use of the grade: _____

CROSS-LISTING

18. If the course is to be cross-listed, indicate the subject and course number of the cross-listing(s) (please note, all cross-listed courses should be offered at the same numerical level): ECE, PHYS
19. **Note: Additional approvals are required.** Attach a letter or e-mail of support from the head of each cross-listing department. In addition, if the cross-listing involves a different college, approval from that college must be obtained as well.

ADDITIONAL COURSE INFORMATION

20. Does the addition of this course impact other courses (i.e., prerequisite or credit restriction statements)?
 Yes No If yes, please list the course(s) affected, and note that a Course Revision Form may be necessary to update the impacted course(s): _____
21. Has this course been offered as a special topics or other type of experimental course?
 Yes No If yes, please indicate the Banner subject, course number, section ID, term, and enrollment for each offering: _____
22. Does the addition of this course have any impact on your current curriculum (i.e., Programs of Study catalog, concentrations, minors, etc.)?
 Yes No If yes, please explain: Broadens the curriculum, attracting students to nuclear eng.
23. Will this course be submitted for General Education credit?
 Yes No
24. Will sections of this course be offered for Independent Study?
 Yes No
25. Does this course require students to register in multiple schedule components (e.g., lecture and a lab)?
 Yes No
26. Is a special facility needed to effectively teach this class (e.g., lab, studio, or ITS room)?
 Yes No If yes, please describe: Engineering Workstations & the electrochemical lab of NEL 104.
27. Faculty member(s) who will teach this course: George H. Miley, Nie Luo, Magdi Ragheb
28. Course proposed by: George H. Miley, Nie Luo, Magdi Ragheb

APPROVALS

(Signatures required)

Department/Unit	Date
School (if applicable)	Date
College	Date
Graduate College (400 & 500 level courses)	Date
Provost	Date

Revised 12/2007