

## APPLICATION FOR NEW COURSE

1. Submitted by the College of Engineering Date: 10/29/2009

Department/Division proposing course: Electrical and Computer Engineering

2. Proposed designation and Bulletin description of this course:

a. Prefix and Number EE 536

b. Title\* Power System Fault Analysis and Protection

\*If title is longer than 24 characters, write a sensible title (24 characters or less) for use on transcripts:  
PWR SYS FAULT ANA PROT

c. Courses must be described by at least one of the categories below. Include the number of actual contact hours per week for each category, as applicable.

( ) CLINICAL    ( ) COLLOQUIUM    ( ) DISCUSSION    ( ) LABORATORY    ( 3 ) LECTURE  
( ) INDEPEND. STUDY    ( ) PRACTICUM    ( ) RECITATION    ( ) RESEARCH    ( ) RESIDENCY  
( ) SEMINAR    ( ) STUDIO    ( ) OTHER – Please explain: \_\_\_\_\_

d. Please choose a grading system:  Letter (A, B, C, etc.)     Pass/Fail

e. Number of credit hours: 3

f. Is this course repeatable?    YES     NO     If YES, maximum number of credit hours: \_\_\_\_\_

g. Course description:

This course teaches computer based methods for performing fault analysis of power systems, and principles for protecting power systems.

h. Prerequisite(s), if any:

EE 537, or concurrent, and Engineering Standing.

i. Will this course be offered through Distance Learning?    YES     NO

If YES, please identify one of the methods below that reflects how the majority of the course content will be delivered:

Internet/Web-based     Interactive video     Extended campus     Kentucky Educational Television (KET/teleweb)     Other

Please describe "Other": \_\_\_\_\_

3. Teaching method:  N/A or  Community-Based Experience     Service Learning Component     Both

4. To be cross-listed as: \_\_\_\_\_  
Prefix and Number    Signature of chair of cross-listing department

5. Requested effective date (term/year): Spring / 2010

## APPLICATION FOR NEW COURSE

6. Course to be offered (please check all that apply):  Fall  Spring  Summer
7. Will the course be offered every year?  YES  NO  
If NO, please explain: \_\_\_\_\_
8. Why is this course needed?  
This course covers power system fault analysis and protection, which is not covered by existing courses. This course had been offered twice as EE599/699 and needs an official course number.
9. a. By whom will the course be taught? Dr. Yuan Liao
- b. Are facilities for teaching the course now available?  YES  NO  
If NO, what plans have been made for providing them?  
\_\_\_\_\_
10. What yearly enrollment may be reasonably anticipated?  
20
11. a. Will this course serve students primarily within the department?  Yes  No
- b. Will it be of interest to a significant number of students outside the department?  YES  NO  
If YES, please explain.
12. Will the course serve as a University Studies Program course<sup>†</sup>?  YES  NO  
If YES, under what Area? \_\_\_\_\_  
<sup>†</sup>AS OF SPRING 2007, THERE IS A MORATORIUM ON APPROVAL OF NEW COURSES FOR USP.
13. Check the category most applicable to this course:
- traditional – offered in corresponding departments at universities elsewhere
  - relatively new – now being widely established
  - not yet to be found in many (or any) other universities
14. Is this course applicable to the requirements for at least one degree or certificate at UK?  Yes  No
15. Is this course part of a proposed new program?  YES  NO  
If YES, please name: \_\_\_\_\_
16. Will adding this course change the degree requirements for ANY program on campus?  YES  NO  
If YES<sup>‡</sup>, list below the programs that will require this course:

<sup>‡</sup>In order to change the program(s), a program change form(s) must also be submitted.



## APPLICATION FOR NEW COURSE

17.  The major teaching objectives of the proposed course, syllabus and/or reference list to be used are attached.
18.  Check box if course is 400G or 500. If the course is 400G- or 500-level, *you must include a syllabus showing differentiation* for undergraduate and graduate students by (i) requiring additional assignments by the graduate students; and/or (ii) the establishment of different grading criteria in the course for graduate students. (See *SR 3.1.4*)

19. Within the department, who should be contacted for further information about the proposed new course?

Name: Yuan Liao Phone: 859-257-6064 Email: yliao@engr.uky.edu

20. Signatures to report approvals:

<u>11/23/2009</u> DATE of Approval by Department Faculty	<u>Larry Holloway</u> <small>printed name</small> Reported by Department Chair <small>signature</small> 
<u>03/26/10</u> DATE of Approval by College Faculty	<u>RICHARD J. SWEIGAARD</u> /  <small>printed name</small> Reported by College Dean <small>signature</small>
<u>4/27/2010</u> * DATE of Approval by Undergraduate Council	/ <small>printed name</small> Reported by Undergraduate Council Chair <small>signature</small>
* DATE of Approval by Graduate Council	/ <small>printed name</small> Reported by Graduate Council Chair <small>signature</small>
* DATE of Approval by Health Care Colleges Council (HCCC)	/ <small>printed name</small> Reported by Health Care Colleges Council Chair <small>signature</small>
* DATE of Approval by Senate Council	/ Reported by Office of the Senate Council
* DATE of Approval by University Senate	/ Reported by Office of the Senate Council

\*If applicable, as provided by the *University Senate Rules*



# EE 536 Topics in Power System Fault Analysis and Protection Spring Term 2010

**Class Time:** 11:00 - 12:15 PM on Tuesday and Thursday

**Room:** MMRB Rm. 112

**Instructor:** Yuan Liao

**Office:** 691 FPAT, **Phone:** 859-257-6064, **Email:** yliao@engr.uky.edu

**Office hours:** 10:00 – 11:00 AM on Tuesday and Thursday

**Text:** Material prepared by the instructor, available in the library, which can be copied by the students.

## References:

- (1) Ramasamy Natarajan, Computer Aided Power System Analysis, Marcel Dekker, Inc., NY, 2002.
- (2) J. J. Grainger and W. D. Stevenson Jr., Power Systems Analysis, McGraw Hill 1994
- (3) S.H. Horowitz and A. G. Phadke, Power System Relaying, Research Studies Press Ltd., 1995.
- (4) J. L. Blackburn, Protective Relaying – Principles and Applications, Marcel Dekker, Inc., 1998.
- (5) Research papers distributed to class

**Course Description:** This course teaches computer based methods for performing fault analysis of power systems, and principles for protecting power systems.

**Prerequisites:** Engineering Standing or consent of the instructor

## Topics:

1. Review of basic concepts of three phase power system: phasor, voltage and current relationship, per unit
2. Computer based method for bus admittance matrix construction
3. Computer based method for bus impedance matrix construction
4. Symmetrical component theory
5. Fault analysis (both balanced and unbalanced faults)
6. Over-current protection
7. Distance protection
8. Differential protection

**Learning Outcomes:** Upon completion of this course the students should demonstrate the ability to:

1. Construct bus admittance matrix of a network, both manually and by developing computer programs
2. Construct bus impedance matrix of a network, both manually and by developing computer programs
3. Apply symmetrical component theory and bus impedance matrix technique for analyzing faulted power system
4. Understand basic power system protection principles

## Exam:

- Exam A (February 4, 2010), closed book, in class
- Exam B (March 4, 2010), closed book, in class
- Exam C (April 8, 2010), closed book, in class
- Project (due on: May 6, 2010, 1:00 PM), take-home project, submitted to my office

## Grading

Homework: Homework assignments will be made during lecture periods. Each homework problem counts equal weight in calculating the homework grade average (HW Avg). Homework solutions will be placed in reserve folder in Engineering Library after due date.

Midterm evaluation: midterm course average is determined by  
$$\text{Course Avg} = (\text{ExamA} + \text{ExamB} + \text{HW Avg})/3$$

For undergraduate student, the Letter Grade will be determined from the Course Average as:  
>= 90: A; >=80: B; >=70: C; >=60: D; <60: E

Final Course Grade: The Course Average will be determined by the following formula:

$$\text{Course Avg} = (\text{ExamA} + \text{ExamB} + \text{ExamC} + \text{Project} + \text{HW Avg})/5$$

For undergraduate student, the Letter Grade will be determined from the Course Average as:  
>= 90: A; >=80: B; >=70: C; >=60: D; <60: E

For graduate student, the grading scale will be:

>= 90: A; >=80: B; >=70: C; <60: E

**Graduate students will have more problems in the exams and project than undergraduate students.**

Requests for corrections to grades must be made in writing within 14 calendar days of the time the grade was given. After that no changes will be made even if there was an error in grading. You must state clearly the grading errors in the request.

## POLICIES

Attendance: Attendance of lecture is not required, but the student is responsible for any material covered during lecture periods.

Excused Absences: acceptable reasons for excused absences include serious illness, illness or passing away of family member, university-related trips, major religious holidays, as listed at <http://www.uky.edu/Ombud/policies.php>.

Make-up opportunity: for an excused absence, students will be given the opportunity to make up missed assignments. It is the student's responsibility to inform the instructor of the absence preferably in advance, but no later than one week after it.

Verification of Absences: students should provide valid verification of absences, as explained at: <http://www.uky.edu/Ombud/policies.php>.

Submission of Assignments: Assignments can be submitted in class, or submitted to my office, or submitted through email.

Academic integrity, cheating and plagiarism: Cheating and plagiarism is absolutely unacceptable, and violation will result in failure of this course. Details of this policy is referred to: <http://www.uky.edu/Ombud/policies.php>.

Class behavior, decorum and civility: The university (and college/department) is committed to respecting the dignity of all and to value differences among members of our academic community, and fostering academic discovery. Students should demonstrate appropriate decorum and civility. Details of this policy is referred to: <http://www.uky.edu/Ombud/policies.php>.

Professional preparation: N/A

Group work and student collaboration: N/A