** Place your pointer on the underlined fields and start typing to fill in text, ** or use an X or a number to fill in “check-box” or numbered fields.

Provide information requested below that is not contained in the syllabus. Please note the guidelines in the boxes.

Number (if known): **EE 155V** __X__ Undergraduate __ __Graduate __ __Professional

Title/subtitle: _Power System Analysis_

Effective: __Fall 2015__ (Quarter and Year)

Offered: __X__ Fall ___ Winter ___ Spring ___ Summer ___ Once Only ___ Other ___

Instructor(s): __Nanpeng Yu__

Hours per week per unit of credit may not be less than but may exceed those listed below.

- One unit for each hour per week (1:1) of colloquium, consultation, discussion, lecture, seminar, or workshop

- One unit for each three hours per week (1:3) of activity, clinic, extra reading, fieldwork, individual study, internship, laboratory, practicum, research (scheduled and outside), screening, term paper, thesis, tutorial, written work, and similar assigned problems

- One unit for each two to three hours per week (1:2-3) of studio

Units: __4__

Activities and hours per week: Indicate below the number of hours per week that students will spend in the activities listed (leave blank those that do not apply).

- Activity: __ _
- Clinic: __ _
- Colloquium: __ _
- Consultation: __ _
- Discussion: __ _
- Extra Reading: __ _
- Field: __ _
- Individual Study: __ _
- Internship: __ _
- Laboratory: __ _
- Lecture: __ _
- Practicum: __ _
- Research (outside): __ _
- Research (scheduled): __ _
- Screening (outside): __ _
- Screening (scheduled): __ _
- Seminar: __ _
- Studio: __ _
- Term Paper: __ _
- Thesis: __ _
- Tutorial: __ _
- Workshop: __ _
- Written Work: __ _
- Other: __ _

Prerequisite(s): __EE 001B: Engineering Circuit Analysis II and EE 116 Engineering Electromagnetics__
Read the guidelines in this box before writing the Catalog description.

Write the description in the present tense and limit it to 50 words (do not count grading information, repeatability information, or a list of E-Z subtitles). If possible, do not use complete sentences. However, use sentences that contain more than a list of items or topics.

Examples:
Instead of "This course will introduce students to the history of . . .," use one of the following formats:
- Introduces the history of . . .
- An introduction to the history of . . .
- Introduction to the history of . . .

Instead of "Functions, equations, and graphs," use a format similar to one of the following examples:
- Explores functions, equations, and graphs . . .
- Topics include functions, equations, and graphs . . .
- A study of functions, equations, and graphs . . .

Catalog description: A study of long-distance transmission of electric power with emphasis on admittance and impedance modeling of components and systems, optimal power flow calculations and applications, symmetrical and unsymmetrical fault calculations, economic operation of large-scale generation and transmission systems, analysis of transmission and distribution networks.

<table>
<thead>
<tr>
<th>Grading</th>
<th>X Letter Grade or petition for Satisfactory/No Credit (S/NC)</th>
<th>___ Letter Grade only</th>
<th>___ In Progress (IP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>___</td>
<td>___ Letter Grade or S/NC; no petition required</td>
<td>___ S/NC only</td>
<td></td>
</tr>
</tbody>
</table>

The statements selected below will be added to the Catalog description by the Catalog office:

Grading statement (if required):
- Satisfactory (S) or No Credit (NC) grading is not available.
- Graded Satisfactory (S) or No Credit (NC).
- Normally graded Satisfactory (S) or No Credit (NC), but students may petition the instructor for a letter grade on the basis of assigned extra work or examination.
- May be taken Satisfactory (S) or No Credit (NC) with consent of instructor and graduate advisor.
- May be taken Satisfactory (S) or No Credit (NC) by students advanced to candidacy for the Ph.D.
- Students who submit a term paper receive a letter grade; other students receive a Satisfactory (S) or No Credit (NC) grade.
- Students who present a seminar receive a letter grade; other students receive a Satisfactory (S) or No Credit (NC) grade.
- Students who present a seminar or submit a term paper receive a letter grade; other students receive a Satisfactory (S) or No Credit (NC) grade.
- Other: ___

Repeatability statement (if required):
- Course is repeatable.
- Course is repeatable to a maximum of ___ units.
- Course is repeatable as content changes.
- Course is repeatable as content changes to a maximum of ___ units.
- Course is repeatable as topics change.
- Course is repeatable as topics change to a maximum of ___ units.
- Other: ___

If the course is repeatable, may a student take more than one section of the course in a single quarter?  ___ Yes  ___ No

Cross-listing statement: Cross-listed with ___

Credit statement (to limit credit when course content overlaps):
Credit is awarded for only one of ___

Other ___

Breadth statement (for CPAC, ETST, FVC, HASS, or WMST courses only):
- Fulfills the Humanities requirement for the College of Humanities, Arts, and Social Sciences.
Fulfills the Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.
Fulfills either the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.
See the Student Affairs Office in the College of Humanities, Arts, and Social Sciences.
Does not fulfill the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.
Other: ___

If the course content overlaps or duplicates the content of another course, describe the overlap or duplication: ___

If the course affects degrees, minors, and/or programs, list the affected degrees, etc. and explain how they are affected: ___

If the course affects the prerequisites and/or descriptions of other courses, list the affected courses and explain how they are affected: ___

Justification for establishing the course (insert or attach):

This course is needed because it will be used as part of the MSOL online degree program that the BCOE and the ECE department intend to offer. This V version of the course involves the following six components: a) a course management system, e.g., UCR’s iLearn (BlackBoard) system, which UCR has been using for many years and with which most UCR faculty are already familiar; b) for online consultation with TAs and faculty, a web-based meeting system that includes shared desktop, audio, and possibly video communication. c) Remotely available online video recordings of classroom lectures (e.g., Flash 7.0+) with accompanying presentation graphics (e.g., PowerPoint slides). d) Remotely proctored exams, for which we will initially follow UCLA’s policies and protocols. e) Lectures are online and would be a direct 1:1 "contact" as in a regular course. For the consultation, faculty members should be available for 1 hour/week to interact with the student via Skype (or other). f) In the evaluation, homework and other assignments are submitted via e-mail (or within iLearn). All exams are proctored. For remotely proctored exams, UCR intends to initially follow UCLA’s policies and protocols.

Syllabus (insert or attach and include the information below): See attached

Course requirements (e.g., term papers and examinations)

If an activity selected above under “Activities and Hours” does not involve faculty contact (e.g., extra reading, individual study, and outside research), describe the activity and explain how it will be evaluated.

If one of the activities selected above is consultation hours, explain how these hours will be implemented and monitored.

For further information about course guidelines, see the General Rules and Policies Governing Courses of Instruction at senate.ucr.edu/Committees/courses/guidelines.pdf
Course Purpose:

Long-distance transmission of electric power with emphasis on admittance and impedance modeling of components and systems, optimal power flow calculations and applications, symmetrical and unsymmetrical fault calculations, economic operation of large-scale generation and transmission systems, analysis of transmission and distribution networks.

Textbook:


Course Topics:

- Basic Concepts in Power Systems [Chapter 1 and Chapter 2]:
  - Complex Power
  - Impedance and Reactance
  - Single-Phase AC Circuits
  - Three-Phase Balanced AC Circuits
  - Per-Unit Calculations

- Transformers and Synchronous Generators [Chapters 5, 6, 7 and 8]
  - Three-Phase Transformers
  - Tap-Changing and Regulating Transformers
  - Three-Phase Generators
  - Synchronous Machines
  - Real and Reactive Power Control

- Admittance and Impedance Models [Chapter 9]
  - Branch and Node Admittances
  - Network Incidence Matrix and Y-Bus
  - Thevenin Theorem and Z-Bus
  - Power Invariance Transformations

- Power Flow Optimization [Chapter 10]:
  - AC Optimal Power Flow Problem
  - Gauss-Seidel Method
  - Newton-Raphson Method
  - DC Optimal Power Flow Problem
  - Power Flow Studies in System Design and Operation
  - Decoupled Power Flow Methods

- Fault Calculation [Chapter and 12]:
Weekly Schedule:

- Week 3-4: Transformers and Synchronous Generators (Chapters 5 to 8): Three-Phase Transformers, Tap-Changing and Regulating Transformers, Three-Phase Generators, Synchronous Machines, Real and Reactive Power Control.

Prerequisites:

EE 001B: Engineering Circuit Analysis II
EE 116: Engineering Electromagnetics

Grading (Percentage):

Homework – 30%
Midterm Exam: 35%
Final Exam – 35%

Discussion Sessions:

Discussion sessions will work through examples and provide guidance on selected homework problems related to the contents covered in the lectures. Student performance in discussion sessions will be reflected in their homework grades as participation in the activities in discussion sessions will enhance their understanding of the course materials.