

**The University of Texas at Tyler**  
**Department of Electrical Engineering**  
**Houston Engineering Campus**  
**Course: EENG 4310 – Electric Power Systems (Required)**

**Syllabus**

**Catalog Description:**

Magnetic circuits; principles of electromagnetic energy conversion; synchronous machines; three-phase induction machines; Transformers; DC machines; fundamentals of power systems modeling and design; power flow analysis.

**Prerequisites:** EENG 3303, EENG 3305, Pre or Co-requisite MATH 3203

**Credits:** 3 ( 3 hours lecture, 0 hours laboratory per week )

**Text(s):** Glover, Sarma, and Overbye, "Power System Analysis and Design" 6<sup>th</sup> ed., Thomson, 2016.  
**(Required)**

**Additional**

**Reference(s):**

**Material:**  
**(Recommended)**

1. Hindmarch, Electrical Machines and their Applications, Pergamon Press, 2<sup>nd</sup> ed., 1970.
2. Stevenson and Grainger, Power System Analysis, McGraw-Hill, 1996
3. Matlab®
4. Selected articles published in selected journals and conference proceedings
5. Instructor's lecture notes

**Course Coordinator:** Hassan El-Kishky, PhD

**Topics Covered:**

1. AC Power and Power Factor Correction
2. Power Transformers
3. Induction Machines
4. Synchronous Machines
5. Intro to DC Machines
6. Introduction to Power System Modeling
7. Power Transmission Line Models
8. Introduction to Load Flow Analysis
9. Power Factor Correction.
10. Intro to Power Electronics
11. Intro to Renewable Energy

**Evaluation Methods: (only items in dark print apply):**

1. Examinations / Quizzes
2. Homework
3. Reports / Paper
4. Computer Programming
5. Project / Model
6. Presentation
7. Course Participation

**Course Learning Outcomes (formerly Objectives)<sup>1</sup>:** By the end of this course students will be able to:

1. Solve 1-phase and 3-phase circuits for current, voltage, and power [1]
2. Develop and solve the power transmission line models [1,3]
3. Develop and solve the load flow problem in electric power systems [1]
4. Develop and apply the synchronous machine circuit model to determine the impedance, efficiency, and voltage regulation using the EMF and MMF methods [1]
5. Develop and apply the 3-phase induction motor circuit model to determine the machine characteristics and performance measures [1]
6. Determine capacitor size to improve power factor (power factor correction) [1,4]
7. Analyze the fault current (symmetrical fault) in a simple power system [1,4,5]
8. Develop and solve the power transformer circuit model to determine its characteristics and performance [1]
9. Setup experiments to characterize power transformer [3]
10. Setup experiments to characterize the three-phase induction motor [3]
11. Setup experiments to characterize the synchronous machine [3]
12. Setup experiments to characterize power transmission lines [3]
13. Write a paper on the impact of electric power engineering on ethics and professional practice in electric power engineering [3]

<sup>1</sup>Numbers in brackets refer to method(s) used to evaluate the course objective.

**Relationship to Program Outcomes (only items in dark print apply)<sup>2</sup>:** This course supports the following Electrical Engineering Program Outcomes, which state that our students will:

1. have the ability to apply knowledge of the fundamentals of mathematics, science, and engineering. [2,5]
2. have the ability to use modern engineering tools and techniques in the practice of electrical engineering. [3]
3. have the ability to analyze electrical circuits, devices, and systems [1,7,8]
4. have the ability to design electrical circuits, devices, and systems to meet application requirements. [19]
5. have the ability to design and conduct experiments and analyze and interpret experimental results. [9,10,11,12]
6. have the ability to identify, formulate, and solve problems in the practice of electrical engineering using [6] appropriate theoretical and experimental methods. [5]
7. have effective written, visual, and oral communication skills. [17]
8. possess an educational background to understand the global context in which engineering is practiced, including
  - a. knowledge of contemporary issues related to science and engineering. [10]
  - b. the impact of engineering on society. [21]
  - c. the role of ethics in the practice of engineering.[13]
9. have the ability to contribute effectively as members of multi-disciplinary engineering teams.[20]
10. have a recognition of the need for and ability to pursue continued learning throughout their professional careers. [4]

<sup>2</sup>Numbers in brackets refer to course learning outcomes/objective(s) that address the Program Outcome.

**Contribution to Meeting Professional Component: (in semester hours)**

Mathematics and Basic Sciences:	0.25	hours
Engineering Sciences and Design:	2.75	hours
General Education Component:	0	hours

<b>Prepared By:</b>	Hassan El-Kishky	<b>Date:</b>	07/15/2011-08/16/2016
<b>Modified:</b>	Seyed Ghorshi	<b>Date:</b>	08/16/2018
	Hassan El-Kishky	<b>Date:</b>	08/25/2019

Grading:

Exam 1 25% PU system, 3-phase, AC power, power factor correction, Transformers

Exam 2 25% Induction motors, Synchronous machines, Transmission line models

Final Exam 35% Comprehensive

Projects 10% Programming intensive

Assignments 10% No late assignments will be accepted.

Academic Integrity:

Students should be aware that absolute academic integrity is expected of every student in all undertakings at The University of Texas at Tyler. Failure to comply can result in strong university-imposed penalties.

Note:

If you have a disability, including a learning disability, for which you request disability support services/accommodation(s), please contact the Disability Support Services office so that the appropriate arrangements may be made. In accordance with federal law, a student requesting disability support services/accommodation(s) must provide appropriate documentation of his/her disability to the Disability Support Services counselor. In order to assure approved services the first week of class, diagnostic, prognostic, and prescriptive information should be received 30 days prior to the beginning of the semester services are requested. For more information, call or visit the Student Services Center located in the University Center, Room 282. The telephone number is 566-7079 (TDD 565-5579)." Additional information may also be obtained at the following UT Tyler Web address: <http://www.uttyler.edu/disabilityservices>.

Grade Replacement Policy:

If you are repeating this course for a grade replacement, you must file an intent to receive grade forgiveness with the registrar by the 12th day of class. Failure to file an intent to use grade forgiveness will result in both the original and repeated grade being used to calculate your overall grade point average. A student will receive grade forgiveness (grade replacement) for only three (undergraduate student) or two (graduate student) course repeats during his/her career at UT Tyler. (2006-08 Catalog, p. 35)