**The UT Arlington Syllabus Template for 2015-16  
*Frequently Asked Questions***

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| *What’s* ***new*** *for 2015-16?* | The most important revision to this year’s template is the new section titled “Emergency Exit Procedures.” **See below for important details.** We have also updated the final page with information about the library and have made minor revisions throughout. |
| *When must my course syllabus be posted?* | A syllabus for each course that you teach (as the instructor of record) must be made available to students in a medium of your choosing (hard copy, electronic format, or both) by the **first day of class**. |
| *Where must each syllabus be posted?* | Regardless of how you make a syllabus available to students, a syllabus for each course you teach must be posted to your Faculty Profile by the first day of class. **To access your faculty profile (in the new “Profile 2.0” system), go to** [**https://www.uta.edu/mentis**](https://www.uta.edu/mentis)**.**   **The Faculty Profile System, which has been modified to allow for compliance with state law regarding public access to course information, is the sole official University repository for all syllabuses. While you may post or archive a syllabus in other locations, doing so does not meet the requirement to post the syllabus in the Profile System.** |
| *Who is responsible for ensuring that a syllabus has been posted to the Profile System?* | As a basic professional responsibility, the timely and accurate posting of all course syllabuses is the joint responsibility of the course instructor and his or her immediate supervisor. While some units may delegate the task to an administrative staff person, the instructor and his or her immediate supervisor share responsibility for adherence to relevant policies. |
| *What must be included in the syllabus?* | See the following pages for University-required elements. Contact your home unit for advice pertaining to course content. |
| *Is my syllabus binding?* | Yes, inasmuch as it represents a good faith account of what you have planned for the course. As the instructor of record, you are always free to make adjustments that serve your students’ best interests. That said, changes to the syllabus should be announced in a timely fashion, particularly if the change involves a major exam, paper, or project. It is further advised that any syllabus changes be issued in writing *(e.g., via* e-mail, in Blackboard, or with a handout). |
| *May I adjust the formatting of the official template?* | Yes! As the instructor of record, you have control over the formatting and visual presentation of your course syllabus. What’s most important to preserve is the content. In the template, information in:   * **Black text** is **required**. * **Blue text (except for hyperlinks)** is **optional**. * **Red text** is **information for you**; **remove** it from the final document.   Specific colleges, schools, departments, or programs may require additional text. Consult your unit administration for more details. |

**Direct questions about syllabus policies to** [**David Silva**](mailto:djsilva@uta.edu?subject=An%20inquiry%20from%20the%20Syllabus%20Template%20File)**, Vice Provost for Faculty Affairs.**

**The template begins on the following page.**

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**EE5308/EE4328:** POWER SYSTEM MODELING AND ANALYSIS

Fall 2015

**Instructor(s):** Wei-Jen Lee

**Office Number:** ELB 304

**Office Telephone Number:** (817) 272-5046

**Email Address:** wlee@uta.edu

**Faculty Profile:** https://mentis-test.uta.edu/public/#profile/profile/edit/id/258/

**Office Hours:** 9:00 AM – 11:30 AM, TUESDAY & WEDNESDAY (OTHER TIME BY APPOINTMENT)

**Section Information:** EE5308/EE4328

**Time and Place of Class Meetings:** 11:00 – 12:20, Tuesday & Thursday; LS124

**Description of Course Content:** Fundamental concepts for modeling transmission lines, distribution lines, power system generators, power transformers and power system load. The method of symmetrical components is discussed. Simulations of power systems during normal and abnormal conditions are presented. The philosophy of deregulation regarding separation of power systems into generation, transmission and distribution companies is introduced.

**Student Learning Outcomes:** The goal of this course is to give students a good understanding on the fundamental of power systems. This course emphasizes the concept of the phasor, the per unit system, single-phase and three-phase transformers, modeling of the transmission lines, power flow analysis, symmetrical components, and short circuit analysis. In addition, the current development of the utility industry will also be discussed.

Learning the materials in this course is an important step toward a rewarding career as a power engineer.

**Required Textbooks and Other Course Materials** J. Duncan Glover, Mulukutla S. Sarma, and Thomas J. Overbye, “Power System Analysis and Design”, 5th Edition, Cengage Learning,

**Descriptions of major assignments and examinations:**

# ITEM POINTS

1. HOMEWORK 20.00

2. MIDTERM EXAMINATION 20.00

3. FINAL EXAMINATION 30.00

5. DESIGN PROJECTS 30.00

TOTAL COURSE POINTS 100.00

**Attendance:**

The general format of the class will be a formal lecture and hand-on experiments to develop the ideas and knowledge required for the understanding the function and applications of protective relay system. Since this is your education, you will be required to participate by:

* Being aware of class procedures as set forth in this syllabus,
* Attending all the lectures and labs,
* Reading all assigned materials prior to the lecture,
* Working the assigned homework problems,
* Being aware of the course calendar, particularly examination times and dates

The grade of **W** will be assigned only if the conditions imposed by the University are met. The grade of **X** will be assigned only if the student has encountered circumstances beyond his or her control and the student’s previous actions have not created these circumstances. The assignment of this incomplete grade will be made at the decision of the instructor after consideration of the facts as presented in a written request from the student. See the Registrar’s Bulletin or the University Calendar in the front part of the UTA catalog for drop dates.

**Grading**:

STUDENT COURSE AVERAGE FINAL LETTER GRADE

90.0 - 100.0 A

80.0 - 89.9 B

70.0 - 79.9 C

60.0 - 69.9 D

0.0 - 59.9 F

**Make-up Exams and Grade Grievances:**

**HOMEWORKS:** are due at the end of the class on the day the assignment is due. All work presented must meet professional standards regarding materials and format. Homework will be checked as to effort and number of problems presented. The homework grade is based on one hundred (100) points per assignment. Since it is faculty’s strongly belief that a student’s success is directly proportional to success with homework, it is imperative that the homework be done thoroughly.

It is the expressed policy of the faculty of the department to take decisive action involving any incidence relating to academic dishonesty. The instructor of this course will strictly enforce this policy!

**LATE HOMEWORK ASSIGNMENTS:** Homework must be turned in at the end of the class period on the day the assignment is due. No late homework will be accepted after the solution is posted in the copy center or on the web site. There will be a 25% grade reduction for each class period late.

**MAKE UP OF MISSED EXAMINATION:** There will be no makeup of a missed examination. All missed examination points will be reassigned to the point value of the next examination.

**MAKE UP OF MISSED FINAL EXAMINATION:** There will be no makeup of a missed examination. If the missing of the final examination is unexcused, the student will receive the course grade computed with a Final Exam with score of zero. If the student has an excused absence from the final examination, there are two options: 1) the student may elect to receive the course grade earned with the final counted as a zero, or 2) the student may elect to receive the grade of “Incomplete” and make arrangements to complete the course by taking the final examination. If the student elects the second option, it is the responsibility of the student to make necessary arrangement with the instructor to complete the course within specific time frame that has been defined by the university.

**CONSIDERATION OF RE-GRADING REQUEST:** It is the student’s responsibility to keep up with various grades assigned to their work by the instructor. If there is any question concerning the assigned grade, the instructor will accept a formal request to examine the grading in question if such a request is presented to the instructor within one-week following the returning of the material in question from the instructor. The entire original work in question must be submitted to the instructor. The instructor reserves the rights to re-grade the entire materials.

**Drop Policy:** Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance**. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://wweb.uta.edu/aao/fao/>).

**Americans with Disabilities Act:** The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at [www.uta.edu/disability](http://www.uta.edu/disability) or by calling the Office for Students with Disabilities at (817) 272-3364.

**Academic Integrity:** Students enrolled in this course are expected to adhere to the UT Arlington Honor Code:

*I pledge, on my honor, to uphold UT Arlington’s tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.*

*I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.*

UT Arlington faculty members may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents’ Rule* 50101, §2.2, suspected violations of university’s standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student’s suspension or expulsion from the University.

**Student Support Services**:UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to [resources@uta.edu](mailto:resources@uta.edu), or view the information at [www.uta.edu/resources](http://www.uta.edu/resources).

**Electronic Communication:** UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

**Student Feedback Survey:** At the end of each term, students enrolled in classes categorized as “lecture,” “seminar,” or “laboratory” shall be directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student’s feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington’s effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit <http://www.uta.edu/sfs>.

**Final Review Week:** A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

**Emergency Exit Procedures:** Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit.. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals.

**Course Schedule.**

**CHAPTER 1 Introduction**

1.1 History of Electric Power Systems

1.2 Present and Future Trends

1.3 Electric Utility Industry Structure

1.4 Computers in Power System Engineering

1.5 PowerWorld Simulator

**CHAPTER 2 Fundamentals**

2.1 Phasors

2.2 Instantaneous Power in Single-Phase AC Circuits

2.3 Complex Power

2.4 Network Equations

2.5 Balanced Three-Phase Circuits

2.6 Power in Balanced Three-Phase Circuits

2.7 Advantages of Balanced Three-Phase Versus Single-Phase Systems

**CHAPTER 3 Power Transformers**

3.1 The Ideal Transformer

3.2 Equivalent Circuits for Practical Transformers

3.3 The Per-Unit System

3.4 Three-Phase Transformer Connections and Phase Shift

3.5 Per-Unit Equivalent Circuits of Balanced Three-Phase Two-Winding Transformers

3.6 Three-Winding Transformers

3.7 Autotransformers

3.8 Transformers with Off-Nominal Turns Ratios

**CHAPTER 4 Transmission Line Parameters**

4.1 Transmission Line Design Considerations

4.2 Resistance

4.3 Conductance

4.4 Inductance: Solid Cylindrical Conductor

4.5 Inductance: Single-Phase Two-Wire Line and Three-Phase Three-Wire Line with Equal Phase Spacing

4.6 Inductance: Composite Conductors, Unequal Phase Spacing, Bundled Conductors

4.7 Series Impedances: Three-Phase Line with Neutral Conductors and Earth Return

4.8 Electric Field and Voltage: Solid Cylindrical Conductor

4.9 Capacitance: Single-Phase Two-Wire Line and Three-Phase Three-Wire Line with Equal Phase Spacing

4.10 Capacitance: Stranded Conductors, Unequal Phase Spacing, Bundled Conductors

4.11 Shunt Admittances: Lines with Neutral Conductors and Earth Return

4.12 Electric Field Strength at Conductor Surface and at Ground Level

4.13 Parallel Circuit Three-Phase Lines 215

**CHAPTER 5 Transmission Lines: Steady-State Operation**

5.1 Medium and Short Line Approximations

5.2 Transmission-Line Differential Equations

5.3 Equivalent p Circuit

5.4 Lossless Lines

5.5 Maximum Power Flow

5.6 Line Loadability

5.7 Reactive Compensation Techniques

**CHAPTER 6 Power Flows**

6.1 Direct Solutions to Linear Algebraic Equations: Gauss Elimination

6.2 Iterative Solutions to Linear Algebraic Equations: Jacobi and Gauss Seidel

6.3 Iterative Solutions to Nonlinear Algebraic Equations: Newton Raphson

6.4 The Power Flow Problem

6.5 Power Flow Solution by Gauss Seidel

6.6 Power Flow Solution by Newton Raphson

6.7 Control of Power Flow

**CHAPTER 7 Symmetrical Faults**

7.1 Series R–L Circuit Transients

7.2 Three-Phase Short Circuit—Unloaded Synchronous Machine

7.3 Power System Three-Phase Short Circuits

7.4 Bus Impedance Matrix

7.5 Circuit Breaker and Fuse Selection

**CHAPTER 8 Symmetrical Components**

8.1 Definition of Symmetrical Components

8.2 Sequence Networks of Impedance Loads

8.3 Sequence Networks of Series Impedances

8.4 Sequence Networks of Three-Phase Lines

8.5 Sequence Networks of Rotating Machines

8.6 Per-Unit Sequence Models of Three-Phase Two-Winding Transformers

8.7 Per-Unit Sequence Models of Three-Phase Three-Winding Transformers

8.8 Power in Sequence Networks

**CHAPTER 9 Unsymmetrical Faults**

9.1 System Representation

9.2 Single Line-to-Ground Fault

9.3 Line-to-Line Fault

9.4 Double Line-to-Ground Fault

9.5 Sequence Bus Impedance Matrices

**CHAPTER 10 System Protection**

10.1 System Protection Components

10.2 Instrument Transformers

10.3 Overcurrent Relays

10.4 Radial System Protection

10.5 Reclosers and Fuses

10.6 Directional Relays

10.7 Protection of Two-Source System with Directional Relays

10.8 Zones of Protection

10.9 Line Protection with Impedance (Distance) Relays

10.10 Differential Relays

10.11 Bus Protection with Differential Relays

10.12 Transformer Protection with Differential Relays

10.13 Pilot Relaying

10.14 Digital Relaying

**CHAPTER 11 Transient Stability**

11.1 The Swing Equation

11.2 Simplified Synchronous Machine Model and System Equivalents

11.3 The Equal-Area Criterion

11.4 Numerical Integration of the Swing Equation

11.5 Multi-machine Stability

11.6 A Two-Axis Synchronous Machine Model

11.7 Wind Turbine Machine Models

11.8 Design Methods for Improving Transient Stability

“*As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. –Wei-Jen Lee”*

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