Philadelphia University
Faculty of Engineering
Department of Electrical
First semester, 2014/2015

Course Syllabus

Course Title: power systems analysis
Course code: 610480 & 610485
Course Level: Four
Course prerequisite: 610381
Credit hours: Three Hours

Academic Staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Rank</th>
<th>Office Number and Location</th>
<th>Office Hours</th>
<th>E-mail Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Audih al Faoury</td>
<td>Assistance Professor</td>
<td>6810</td>
<td>9-10</td>
<td><a href="mailto:Audihalfaouryi@gmail.com">Audihalfaouryi@gmail.com</a></td>
</tr>
</tbody>
</table>

Course description:
1- Know of electrical networks analysis and their component.
2- Know the faults types on the electric systems.
3- Calculate the impedances and reactance of short-circuits.
4- Know the sequence of power system and load flow analysis.

Course objectives:
-Basic Concept: Power in 3-Phase, per units, Node equation.
-Transformer: 3-Phase Transf. and Autotransf., Tap Changing and Regulating Transformer.
-Synchronous Machine: 3-phase generator, synchronous reactance, P and Q control, Loading capability diagram, short-circuit, voltage regulation.
-Capacitance of Transmission Line: Electric field, potential differences, Capacitance of 2-wire and three-phase, Effect of earth, Capacitance calculation.

Course components
- Books (title, author(s), publisher, year of publication)
Teaching methods:

- Lectures (3 per week) are used to describe and develop the concepts listed above.
- Supervisions are used to solve problems set (tutorials) by various exercises.

Learning outcomes:

Upon completing the course, student should be able to:

- Knowledge and understand:
  - Understand various types of electrical power used in energy processing and their calculations.
  - Analyze and investigate the load flow in electrical power systems.
  - Compare and contrast the operation of different types of electrical power configurations.
  - Solve electrical power equations related to the various circuits analysis.

- Intellectual skills:
  - Make seminars on various subjects in electrical power systems.
  - Analyze simple problems related to energy processing.
  - Make seminars on various subjects in electrical power.
  - Write a technical reports related to this subject.

- Practical skills:
  - Solve the problems related to electrical power systems.
  - Appreciate the importance of electrical power role in industry.
  - Interpret results and correlate them with theoretical predictions.
  - Understand the load flow and the importance of earthing in power systems.

Assessment instruments

- Short reports and/ or presentations, and/ or Short research projects
- Quizzes.
- Assignments.
- Final examination: 40 marks

<table>
<thead>
<tr>
<th>Allocation of Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assessment Instruments</strong></td>
</tr>
<tr>
<td>First- examination</td>
</tr>
<tr>
<td>Second examination</td>
</tr>
<tr>
<td>Reports, research projects, Quizzes, Assignments, Projects</td>
</tr>
<tr>
<td>Final examine</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>
**Documentation and academic honesty**

- Documentation style (with illustrative examples)

Hand written and typed lecture notes including solved examples and tutorial problems are prepared from various references related to the topics. The student shall try to solve these tutorial problems by himself while answers are given individually. The solution of these problems is given to the student before the final examination.

- Protection by copyright
- Avoiding plagiarism.

**Course academic calendar**

<table>
<thead>
<tr>
<th>week</th>
<th>Basic and support material to be covered</th>
<th>Assignments /reports and their due dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Power in 3-Phase</td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Per units, Node equation.</td>
<td>assignment</td>
</tr>
<tr>
<td>(3)</td>
<td>3-Phase transf, Tap-changing and Regulating Transformer</td>
<td></td>
</tr>
<tr>
<td>(4)</td>
<td>3-phase generator, synchronous reactance.</td>
<td></td>
</tr>
<tr>
<td>(5)</td>
<td>Active and reactive control, Loading capability diagram, voltage regulation.</td>
<td></td>
</tr>
<tr>
<td>(6)</td>
<td>Series Impedance of Transmission Line: Resistance, Inductance</td>
<td>Report</td>
</tr>
<tr>
<td>(7)</td>
<td>First examination</td>
<td>Capacitance of Transmission Line</td>
</tr>
<tr>
<td>(8)</td>
<td>Current and Voltage Relation On TL: Short, Medium</td>
<td>assignment</td>
</tr>
<tr>
<td>(9)</td>
<td>Current and Voltage Relation On TL: Long transmission Line,</td>
<td></td>
</tr>
<tr>
<td>(10)</td>
<td>Current and Voltage Relation On TL: Reactive compensation and transient analysis.</td>
<td>Quiz</td>
</tr>
<tr>
<td>(12)</td>
<td>Symmetrical Fault: Fault Calculation Using $Z_{sym}$, CB selection</td>
<td></td>
</tr>
<tr>
<td>(13)</td>
<td>Symmetrical Component &amp; Sequence Networks: Y-$\Delta$ symmetrical circuit, Power in Transf. of Symmetrical Component</td>
<td>assignment</td>
</tr>
<tr>
<td>(14)</td>
<td>Symmetrical Component &amp; Sequence Networks: Sequence Circuit, Unsymmetrical Series Impedance, Sequence Network</td>
<td>Quiz</td>
</tr>
<tr>
<td>(16)</td>
<td>Final Examination</td>
<td>Unsymmetrical Fault: Single Double Line-to-Ground, Open-Conductor Fault</td>
</tr>
</tbody>
</table>
Expected workload:

On average students need to spend 2 hours of study and preparation for each 50-minute lecture/tutorial.

Attendance policy:

Absence from lectures and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

Course references

Books
---------------------------------------------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------------------------------

Journals
---------------------------------------------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------------------------------

Websites
---------------------------------------------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------------------------------