Course Syllabus

**Course Title**: Power system protection  
**Course code**: 610585

**Course Level**: Fifth Year  
**Course prerequisite**: power system 2 (610482)

**Credit hours**: 3 hours/week

<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. Mohammed Towfeeq</td>
<td>Associated Professor</td>
<td>822-Electrical Engineering Dept.</td>
<td>9:00-11:00 (Monday and Wednesday)</td>
<td><a href="mailto:drmohamadtofik@yahoo.com">drmohamadtofik@yahoo.com</a></td>
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</tbody>
</table>

**Course module description:**

The aim of this course is to understand the basic philosophy and elements of protection system, studying the principles for protecting different elements and studying different technologies used in designing protective relays.

1. Introduction and philosophy of power system protection
2. Protective relays and instrument transformers.
3. Low-voltage and high-voltage fuses and circuit breakers.
4. Protection of generators and motors.
5. Transformer protection and transmission line protection.
6. Relay coordination and commercial power systems
7. Application of computer programs for protective device.

**Course module objectives:**

At completing this course the student should be able to:

1. Understand the principles and aspects of power system protection.
2. Equip with skills and knowledge to select, apply and operate protection systems.
3. Understand the state-of-the-art protective techniques and its applications.
Course/ module components

- **Text Book:**
  J.L. Blackburn, Protective Relaying, Marcel Dekker, Inc., 1987
- **Support material (s) (vcs, acs, etc).**
- **Study guide (s) (if applicable)**
- **Homework and laboratory guide (s) if (applicable).**

**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:**

**Knowledge and understanding**

Having successfully completed the course, the student will be able to demonstrate knowledge and understanding of:

- The various types of protection systems.
- The types of protective relays.
- Performance and design calculations for transformers and generator protection schemes.
- Instrument transformer design and selection.
- Types of protective devices and their choices.
- Unit and non-unit protection systems.

**Cognitive skills (thinking and analysis).**

Students are allowed to make seminars on various subjects in power system protection schemes with comprehensive discussions.

**Communication skills (personal and academic).**

Having successfully completed the module, student will be able to:

- Appreciate the importance of protective relays in power systems.
- Compare and contrast the operation of different types of protective schemes.
- Derive equations related to the different protection methods.
- Formulate relevant equivalent circuits of the protection schemes to calculate their actual behavior.
- Identify different types of protective relays and their applications.
- Analyze simple problems related to protection schemes.
Practical and subject specific skills (Transferable Skills).

Having successfully completed the module, the student will be able to:

- Choose among the different types of protection schemes to suit a given application task.
- Explain the operation and performance of different types of protective relays.
- Apply engineering studies for different types of power system protection.
- Interpret results and correlate them with theoretical predictions.
- Write a technical reports.

Assessment instruments

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

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<tr>
<th>Allocation of Marks</th>
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<tr>
<td>Assessment Instruments</td>
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<tr>
<td>First examination</td>
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<td>Second Examination</td>
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<tr>
<td>Final examination</td>
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<tr>
<td>Reports, research projects, Quizzes, Home works, Projects</td>
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<tr>
<td>Total</td>
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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/module academic calendar

<table>
<thead>
<tr>
<th>week</th>
<th>Basic and support material to be covered</th>
<th>Homework/reports and their due dates</th>
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<tbody>
<tr>
<td>(1)</td>
<td>Introduction and philosophy of power system protection</td>
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<tr>
<td>(2)</td>
<td>Aspects of power system protection</td>
<td>Homework No.1</td>
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<tr>
<td>(3)</td>
<td>Protective relays and instrument transformers</td>
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<tr>
<td>(4)</td>
<td>Current and voltage transformers</td>
<td>Homework No.2</td>
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<td>(5)</td>
<td>Protection components</td>
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<td>(6)</td>
<td>Low-voltage and high-voltage fuses</td>
<td>Homework No.3</td>
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<tr>
<td>(7)</td>
<td>Low-voltage and high-voltage circuit breakers</td>
<td>Report No.1</td>
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<tr>
<td>(8)</td>
<td>Applications</td>
<td></td>
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<tr>
<td>(9)</td>
<td>Protection of generators</td>
<td></td>
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<tr>
<td>(10)</td>
<td>Protection of motors</td>
<td>Homework No.4</td>
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<tr>
<td>(11)</td>
<td>Transformer protection</td>
<td></td>
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<td>(12)</td>
<td>Transmission line protection</td>
<td>Homework No.5</td>
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<tr>
<td>(13)</td>
<td>Relay coordination</td>
<td></td>
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<td>(14)</td>
<td>Commercial power systems</td>
<td>Homework No.6</td>
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<tr>
<td>(15)</td>
<td>Application of computer programs for protective device coordination</td>
<td>Report No.2</td>
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<td>(16)</td>
<td>Final Examination</td>
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**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.

**Module references**

**Books**

ReferenceBooks


**Journals**

IEEE Transactions on Power Apparatus and Systems

**Websites**

www.wikipedia.org