



## A. Basic Information

**Course Title:** Switch Gear and Protection

**Code:** EPE321

**Lecture:** 4

**Tutorial:** 2

**Practical:** -

**Total:** 6

**Program on which the course is given:** B.Sc. Electrical Engineering (Power)

**Major or minor element of program:** Major

**Department offering the program:** Electrical Engineering Department

**Department offering the course:** Electrical Engineering Department

**Academic year / level:** Third Year / Second Semester

**Date of specifications approval:** 10/5/2006

## B. Professional Information

### 1. Overall aims of course

By the end of the course the students will be able to:

- Understanding the fundamental of protective relaying.
- Knowing the function, types, standard specifications and transient response of current transformers.
- Knowing the function, types, standard specifications and connection of potential transformers
- Analyze Fault calculations on power system (symmetrical and unsymmetrical)
- Knowing the different types of power network interrupters
- Understanding the principle of operation of overcurrent protection, directional unit, and differential protection.
- Understanding the different protective schemes on electrical generators, transmission systems, power transformers, induction motors, busbars.
- Knowing the function, types, characteristics and standard specifications of electrical fuses.

### 2. Intended Learning outcomes of Course (ILOs)

#### a. Knowledge and Understanding:



- a.1) Concepts and theories of mathematics and sciences, appropriate to the discipline.
- a.5) Methodologies of solving engineering problems, data collection interpretation.
- a.8) Current engineering technologies as related to disciplines.
- a.13) Analytical and computer methods appropriate for electrical power and machines engineering.
- a.15) Principles of operation and performance specifications of electrical and electromechanical engineering systems.
- a.17) Basic electrical power system theory.

**b. Intellectual Skills**

- b.2) Select appropriate solutions for engineering problems based on analytical thinking.
- b.3) Think in a creative and innovative way in problem solving and design.
- b.5) Assess and evaluate the characteristics and performance of components, systems and processes.
- b.6) Investigate the failure of components, systems, and processes.
- b.7) Solve engineering problems, often on the basis of limited and possibly contradicting information.
- b.9) Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.
- b.13) Identify and formulate engineering problems to solve problems in the field of electrical power and machines engineering.
- b.16) Analyze the performance of electrical power generation, control and distribution systems.

**c. Professional and Practical Skills**

- c.1) Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.
- c.2) Professionally merge the engineering knowledge, understanding, and feedback to improve design, product and/or services.
- c.8) Apply safe systems at work and observe the appropriate steps to manage risks.
- c.11) Exchange knowledge and skills with engineering community and industry.
- c.17) Apply modern techniques, skills and engineering tools to electrical power and machines engineering systems.

**d. General and Transferable Skills**

- d.1) Collaborate effectively within multidisciplinary team.
- d.2) Work in stressful environment and within constraints.



- d.3) Communicate effectively
- d.5) Lead and motivate individuals.
- d.6) Effectively manage tasks, time, and resources.
- d.7) Search for information and engage in life-long self learning discipline.
- d.8) Acquire entrepreneurial skills.
- d.9) Refer to relevant literatures.

### 3. Contents

No	Topic	No. of hours	ILOs	Teaching / learning methods and strategies	Assessment method
1	Fundamental of protective relaying	6	a8, a15,	Lectures, Class activity, Assignments / homework	Home Assignments, Quizzes, Oral Exam
2	Current transformers and potential transformers	6	a8, b5,	Lectures, Class activity, Assignments / homework	Home Assignments, Quizzes, Oral Exam
3	Current transformers and potential transformers	6	a8, b5,	Lectures, Class activity, Assignments / homework	Home Assignments, Quizzes, Oral Exam
4	Fault calculations on power system (symmetrical and unsymmetrical)	6	a1, a5, a13, a15, a17, b5, c1,	Lectures, Class activity, case study, Assignments / homework	Home Assignments, Quizzes, Oral Exam
5	Circuit Breakers	6	a8, a13,	Lectures, Class activity, Assignments / homework	Home Assignments, Quizzes, Oral Exam
6	Fuses	6	a8, c2, c8,	Lectures, Class activity, Assignments / homework	Home Assignments, Quizzes, Oral Exam
7	Protective relays	6	a8, c2, c8,	Lectures, Class activity, Assignments / homework	Home Assignments, Quizzes, Oral Exam
8	Mid term exam				



9	Protective relays	6	a8, c2, c8,	Lectures, Class activity, Assignments / homework	Home Assignments, Quizzes, Oral Exam
10	Generator protection	6	a1, a5, a8, b2, b6, b7, b9, b13, b16, c2, c8, c11, c17, d1, d2, d3, d5, d6, d7, d8, d9	Lectures, Class activity, Assignments / homework	Home Assignments, Quizzes, Oral Exam
11	Transformer protection	6	a1, a5, a8, b2, b3, b6, b7, b9, b13, c2, c8, c11, c17, d1, d2, d3, d6, d7, d8, d9	Lectures, Class activity, study case, Assignments / homework	Home Assignments, Quizzes, Oral Exam
12	Distance protection	6	a8, b2, b3, b6, b7, b9, b13, c2, c8, d6, d7, d8, d9	Lectures, Class activity, Assignments / homework	Home Assignments, Quizzes, Oral Exam
13	Transmission line protection	6	a8, b2, b3, b6, b7, b9, b13, c2, c8, c11, c17, d1, d2,	Lectures, Class activity, Assignments / homework	Home Assignments, Quizzes, Oral Exam
14	Motors and bus protection	6	a8, b2, b3, b6, b7, b9, b13, c2, c8, c11, c17, d1, d2, d3, d5, d6, d7, d8, d9	Lectures, Class activity, case study, Assignments / homework	Home Assignments, Quizzes, Oral Exam
15	Final exam				
16					

#### 4. Teaching and Learning Methods

Lectures  
 Class activity  
 Case study  
 Assignments / homework

#### 5. Student Assessment Methods

Assignments to assess knowledge, intellectual skills and professional and practical skills.  
 Quiz to assess knowledge, intellectual skills and professional and practical skills.



Mid-term exam to assess knowledge, intellectual skills and professional and practical skills.  
Final exam to assess knowledge, intellectual skills and professional and practical skills.

#### 6. Assessment schedule

Assessment 1 on weeks 2, 5, 9, 11  
Assessment 2 Quizzes on weeks 4, 6, 10, 12  
Assessment 3 Mid-term exam on week 8  
Assessment 4 Oral Exam on week 14  
Assessment 5 Final exam on week 15

#### 7. Weighting of Assessments

Home assignments	6.66%
Quizzes	6.67%
Mid-term examination	20%
Final-term examination	66.7%
Total	100%

#### 8. List of References

##### 8.1 Course Notes

"power system protection", by Prof. Fahmy Elbendary

##### Recommended books

##### 8.2 Essential Books (Text Books)

- L. G. Hewitson, M. Brown and R. Balakrishnan, "Practical power system Protection", Elsevier, New York, 2004.
- J. L. Blackburn and T. J. Domin, "Protective relaying; Principles and Applications", 3rd Edition, Taylor & Francis Group, 2006.

##### 8.3 Recommended Books



8.4 Periodicals Web sites, etc

**9. Facilities Required for Teaching and learning**

Lecture room equipped with overhead projector  
Presentation board, computer and data show

**Course coordinator:** Prof. Dr. Mousa Abd-Allah  
**Course instructor:** Prof. Dr. Mousa Abd-Allah, Prof. Dr. Fahmy Bendary  
**Head of department:** Prof. Dr. Mousa Abd-Allah

**Date:** 11 /11 / 2011