

University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Electrical and Computer Engineering
 Bachelor of Science in Electrical Engineering

Course Syllabus

1. General Information:	
Alpha-numeric codification: INEL 5415 Course Title: Power System Protection Number of credits: 3 Contact Period: 45 Electives in INEL	
2. Course Description:	
English: Design and selection of protective devices used in generation, transmission, and distribution for electrical systems: relays, fuses, breakers, reclosers, arresters. Protection coordination. Selection of other system components such as sectionalizers and throw-overs. Insulation coordination.	
Spanish: Diseño y selección de dispositivos de protección usados en sistemas de generación, transmisión y distribución de energía eléctrica: relevadores, fusibles, interruptores, restauradores y pararrayos. Coordinación de protección, selección de otros componentes del sistema tales como: seccionadores y conmutadores de dos direcciones. Coordinación de aislación.	
3. Pre/Co-requisites and other requirements:	
INEL 4415	
4. Course Objectives:	
This is a course for majors in electric power engineering. After completing the course, the student should be able to specify and set up relays for the protection of a power system.	
5. Instructional Strategies:	
<input checked="" type="checkbox"/> conference <input checked="" type="checkbox"/> discussion <input type="checkbox"/> computation <input type="checkbox"/> laboratory <input type="checkbox"/> seminar with formal presentation <input type="checkbox"/> seminar without formal presentation <input type="checkbox"/> workshop <input type="checkbox"/> art workshop <input type="checkbox"/> practice <input type="checkbox"/> trip <input type="checkbox"/> thesis <input checked="" type="checkbox"/> special problems <input type="checkbox"/> tutoring <input type="checkbox"/> research <input type="checkbox"/> other, please specify:	
6. Minimum or Required Resources Available:	
All students are expected to bring a solid background in electric power systems fundamentals. Students must always bring to class the textbook and a scientific calculator (preferably one that handles complex numbers).	
7. Course time frame and thematic outline	
Outline	Contact Hours
Protective Relaying Introduction & Philosophy	3
CT Performance	3
Operating Principles of Electro-Magnetic Relays	3
Current Differential Relaying, Transformer Protection, Bus Protection	7
Electromagnetic Induction Relays	3
Directional Relays, Application of Overcurrent Relays, Case Studies	9
Distance Relays, Application Case Study	5
Step Distance Protection, Pilot Relaying, Case Study	9
Generator Protection Survey	3

Total hours: (equivalent to contact period)	45
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8. Grading System

Quantifiable (letters) Not Quantifiable

9. Evaluation Strategies (Suggested): The faculty member teaching the course will provide the student with the evaluation strategy he/she will be using throughout the semester. This will be done within the first week of classes.

	Quantity	Percent
<input type="checkbox"/> Exams		
<input type="checkbox"/> Final Exam		
<input checked="" type="checkbox"/> Short Quizzes	<u> 7 </u>	80%
<input type="checkbox"/> Oral Reports		
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio		
<input checked="" type="checkbox"/> Projects	1	20%
<input type="checkbox"/> Journals		
<input type="checkbox"/> Other, specify: Homework	<u> </u>	
TOTAL:		100%

10. Bibliography:

Professor's Notes.

Elmore, W., (2004) Protective Relaying: Theory & Application (2nd Ed), Monticello, NY, Marcel Dekker, Inc.

Blackburn, J. L. (1998) Protective Relaying: Principles & Applications (2nd Ed), Monticello, NY, Marcel Dekker, Inc.

Mason, C. R. The Art & Science of Protective Relaying, GE Publication, available at <http://www.geindustrial.com/pm/notes/artsci/>

11. According to Law 51

Students will identify themselves with the Institution and the instructor of the course for purposes of assessment (exams) accommodations. For more information please call the Student with Disabilities Office which is part of the Dean of Students office (Chemistry Building, room 019) at (787)265-3862 or (787)832-4040 extensions 3250 or 3258.

12. Contribution of Course to meeting the requirements of Criterion 5:

Math	Basic Science	General	Engineering Topic
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13. Course Outcomes

Map to Program Outcomes

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| 1. Possess sufficient knowledge of power system analysis and operation, including short circuits to specify the set up and coordination of protective relaying . | (a) |
| 2. Understand faulted electric power system to successfully to identify applicable protection schemes. | (a) |
| 3. Be able to apply complex variable concepts to the solution of relaying coordination problems. | (a) |
| 4. Be able to follow logical and orderly design procedures to choose the best solution for the relaying of the power system. | (c) |
| 5. Be able to determine criteria to to compare the designed outcome. | (c) |
| 6. Be aware of modern protection schemes using combination of microprocessor based relays. | (k) |

Person (s) who prepared this description and date of preparation: Lionel Orama, Submitted by Lionel Orama, October 2007