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

Course Syllabus

1. General Information:

Alpha-numeric codification: INEL 5495
Course Title: DESIGN PROJECTS IN POWER SYSTEMS
Number of credits: 3
Contact Period: One hour of lecture, two laboratory periods per week (two hours each).
Elective in INEL

2. Course Description:

English: Major design experience in electric power systems. Application of power system fundamentals to the design of a system incorporating engineering standards and realistic constraints. Use of computational tools for the design and analysis of power electronics systems electric power systems

Spanish: Experiencia mayor de diseño en sistemas de potencia eléctrica con énfasis en el uso de computadodras. Aplicación de los fundamentos de sistemas de potencia al diseño de un sistema considerando estándares de ingeniería y restricciones de diseño realistas.

3. Pre/Co-requisites and other requirements:

Knowledge of three-phase circuit analysis, phasor analysis, fault analysis, and per-unit calculations. Requires authorization from the Department Head.

4. Course Objectives:

The purpose of the course is to provide students a major design experience in power systems that prepares them for engineering practice. This is an upper-level course open to both undergraduate and graduate students.

5. Instructional Strategies:

☐conference ☒discussion ☒computation ☒laboratory

☒seminar with formal presentation ☐seminar without formal presentation ☐workshop

☐art workshop ☐practice ☐trip ☐thesis ☐special problems ☐tutoring

☐research ☐other, please specify:

6. Minimum or Required Resources Available:

7. Course time frame and thematic outline

Outline	**Contact Hours**
Introduction to Capstone Design	1
Seminars on topics such as product specification; selection between different system alternatives; social, ethical and policy issues in power systems design; tools for computer aided design of power systems	12
Major design project on one of the following areas: Residential/commercial buildings Industrial complex Transmission system Generation, dispatch, operation, or control of power systems	30
Oral presentation presentation	2
Total hours: (equivalent to contact period)	45

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
☐ **Exams**		
☐ **Final Exam**		
☐ **Short Quizzes**		
☒ **Oral Reports**	**1**	**10**
☐ **Monographies**		
☐ **Portfolio**		
☒ **Projects**	**1**	**40**
☐ **Journals**		
☒ **Other, specify: Progress Reports**	**3**	**50**
TOTAL:		**100%**

10. Bibliography:

References:

1. Papers from professional publications such as IEEE Transactions and Conference Proceedings
2. Electrical Power Distribution and Transmission, by Luces M. Faulkenberry, Walter Coffer; Prentice Hall, 1996.
3. Puerto Rico Electric Power Authority regulation manuals on rates, underground and overhead power lines, transmission line design and complementary electrical design.
4. Transmission and Distribution Electrical Engineering,2nd Ed.; by C. R. Bayliss, 1999
5. Electric Power Distribution System Engineering, by T. Gonen, McGraw-Hill, 1986.
6. Elements of Power System Analysis, by W. Stevenson, McGraw-Hill, 1995.
7. J. Glover and M. Sarma, Power System Analysis and Design, 2nd Edition, PWS Publishing, Boston, 2002.
8. Standards such as:

National Electric Code (NEC)
National Electric Safety Code (NESC)
OSHA
Local regulations (e.g., Natural Resources Department, ARPE construction codes)

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
			√

13. Course Outcomes

Course Outcomes	Map to Program Outcomes
1. Apply power system fundamentals to the design of a system that meet specific needs	**(a)**.
2. Use phasor techniques in the analysis of power systems	**(a)**.
3. Use at least one of the following engineering standards: National Electric Code (NEC), National Electric Safety Code (NESC) or Puerto Rico Electric Power Authority Regulations	**(c)**
4. Prepare a report describing the design process followed	**(c)**
5. Select a solution following the corresponding design standards (addressing the problem specifications)	**(c)**
6. Master the design process, the multiplicity of answers to a problem, and the need for physical thinking, approximation, and simplification to decide on a solution.	**(e)**
7. Describe the problem based on the needs presented in class	**(e)**
8. Design a power system solution based on the problem requirements and realistic constraints.	**(e)**
9. Compare different alternatives in order to present a responsible solution	**(e)**
10. Present a list of materials and study the feasibility of the proposed design	**(e)**
11. Apply ethical analysis in the evaluation of the proposed design	**(f)**
12. Be aware of the CIAPR and the IEEE Codes of Ethics	**(f)**
13. Prepare four written documents: a proposal, two progress report and a final report	**(g)**
14. Present orally their designs at the end of the semester to the UPRM academic community	**(g)**
15. Interpret data from tables and graphs, as well as apply power engineering formulas to complete their designs.	**(g)**
16. Make an assessment of the impact of their design in the environment, as well as the social and ethical implications related to the design	**(h)**
17. Recognize the changing nature of the electrical system characteristics, and thus the importance of keeping abreast with changes in electrical codes, safety guidelines and new design standards in power systems.	**(i)**
18. Be aware of the role of the CIAPR and the IEEE in regulating engineering practice	**(i)**
19. Student will understand current and emerging issues in the design of electric power systems, including load characteristics, mechanical and electrical considerations in selecting system solutions	**(j)**
20. Be aware of applicable socio-economic considerations and implications regarding their engineering design	**(j)**
21. Students will be aware of the social context in which engineering is practiced	**(j)**
22. Use tools such as AutoCAD, Matlab, spreadsheets, and power system analysis software to complete their designs	**(k)**

Person(s) who prepared this description and date of preparation: _____
Submitted by: Efrain O'Neill Nov 2006