

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 4416 Course Title: Power Electronics Number of credits: 3 Contact Period: 3 hours per week Elective course in INEL	
2. Course Description:	
English: Introduction to power semiconductor devices, single-phase and three-phase diode and SCR-based rectifiers, ac voltage controllers, D.C to D.C converters, D.C choppers, single-phase and three-phase PWM inverters Spanish: Introducción de los dispositivos semiconductores de potencia. Análisis de rectificadores monofásicos y trifásicos con SCR, de controladores de voltage ac, D.C to D.C converters and choppers y de inversores monofásicos y trifásicos con PWM.	
3. Pre/Co-requisites and other requirements:	
INEL 4102, INEL 4103 and INEL4201	
4. Course Objectives:	
The course presents fundamental concepts of ac-dc , dc-dc and dc-ac power converters. This is a three credit-hours course, open to Senior Electrical Engineering students. After completing the course, students will have a sound background on the analysis and design of power converters. and they will be able to apply the basic concepts to understand, analyze and design power electronics systems such as power supplies, motor drives, switching power amplifiers.	
5. Instructional Strategies:	
<input checked="" type="checkbox"/> conference <input checked="" type="checkbox"/> discussion <input checked="" 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: Several individual projects on analysis and design of power converters that require usage of circuit simulators and their analysis fixtures as well as mathematical software.	
6. Minimum or Required Resources Available:	
All students are expected to bring a solid background in circuit analysis, elementary differential equations, basic electronics, three-phase circuits.	
7. Course time frame and thematic outline	
Outline	Contact Hours
Introduction to power electronics and applications	1
Introduction to Power semiconductor devices	4
Single phase uncontrolled and controlled rectifiers	6
Three phase uncontrolled and controlled rectifiers	4
D.C to D.C converters	9
D.C Choppers	2
A.C voltage controllers	2
Single phase inverters	5
Three phase inverters	6
Three class tests	6
Total hours: (equivalent to contact period)	45
8. Grading System	
<input checked="" type="checkbox"/> Quantifiable (letters) <input type="checkbox"/> 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	3	40
<input type="checkbox"/> Final Exam	1	30
<input type="checkbox"/> Short Quizzes		
<input type="checkbox"/> Oral Reports		
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio		
<input checked="" type="checkbox"/> Projects	1	30
<input type="checkbox"/> Journals		
<input type="checkbox"/> Other, specify: Homework		
TOTAL:		100%

10. Bibliography:

Professor's Notes

References:

“Fundamentals of Power Electronics”, Erickson & Maksimovic, Kluwer Academic Publishers, 2003.

“Power Electronics”, Mohan, Undeland & Robbins, John Wiley & Sons, 2003.

“Elements of Power Electronics”, Philip T. Krein, Oxford University Press, 1998.

“Introduction to Power Electronics,” Daniel W. Hart, Prentice Hall, 1997.

“Principles of Power Electronics”, Kassakian, Schlecht and Verghese, Addison Wesley ,1991.

“Power Semiconductor Circuits”, Dewan and Straughen, John Wiley & Sons ,1975.

Articles from IEEE Transactions on Power Electronics and Industrial Applications and other journals and conferences.

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

- | | Map to Program Outcomes |
|---|--------------------------------|
| 1. Possess sufficient knowledge of circuit analysis and differential equations to enable understanding of the physical operation of power converters. | (a) |
| 2. Be able to apply flux balance and charge balance principles together with circuit theory to analyze dc-dc PWM power converters. | (a) |
| 3. Be capable of extracting specifications and physical constraints from power electronics verbal problems. | (a) |
| 4. Be capable of designing power converters to meet specific needs. | (c) |
| 5. Be capable of writing effectively and concisely project report on their work on analysis, design and evaluation of power converters | (g) |
| 6. Be able to use information searching tools and resources necessary to be up to date in their discipline | (i) |
| 7. Be capable of using circuit simulators to help on designing power converters as well as on their analysis and evaluation. | (k) |

Person(s) who prepared this description and date of preparation: _____

Submitted by: Efrain O'Neill Nov 2006