

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

**Course Syllabus**

<b>1. General Information:</b>	
Alpha-numeric codification: INEL 5496 Course Title: Design Projects in Power Electronics Number of credits: 3 Contact Period: one hour of lecture and four laboratory hours per week Elective in INEL	
<b>2. Course Description:</b>	
English: Application of Power Electronics fundamentals to the design of a closed loop power electronic system to meet certain specifications and conforming to manufacturing standards. Performance evaluation through P-Spice or Simulink. Spanish:	
<b>3. Pre/Co-requisites and other requirements:</b>	
INEL 4416	
<b>4. Course Objectives:</b>	
The purpose of the course is to provide students with a major design experience in Power Electronic systems that prepares them for engineering practice. A major design experience will involve the identification of an engineering problem, providing potential solutions using power electronics, selecting a solution, and designing a power electronic system. Validation of designs would be carried out through simulations and /or hardware implementation. Electric, magnetic and thermal designs would conform to industrial standards and materials.	
<b>5. Instructional Strategies:</b>	
<input checked="" type="checkbox"/> conference <input checked="" type="checkbox"/> discussion <input checked="" type="checkbox"/> computation <input checked="" type="checkbox"/> laboratory <input type="checkbox"/> seminar with formal presentation <input checked="" 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 type="checkbox"/> special problems <input type="checkbox"/> tutoring <input type="checkbox"/> research <input type="checkbox"/> other, please specify:	
<b>6. Minimum or Required Resources Available:</b>	
P-Spice, MATLAB, Power Electronics Laboratory	
<b>7. Course time frame and thematic outline</b>	
<b>Outline</b>	<b>Contact Hours</b>
Topologies used in switching power supplies	5
Modeling, small signal analysis and transfer functions	3
Magnetic design, design equations, output filter and transformer design	3
Diodes, BJTs, Power MOSFETs and IGBTs: Characteristics and selection, Heat sinks	1
Feedback loop design	3

<b>Total hours: (equivalent to contact period)</b>	15

**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	2	20
<input checked="" type="checkbox"/> Oral Reports	1	10
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio		
<input checked="" type="checkbox"/> Projects	1	70
<input type="checkbox"/> Journals		
<input type="checkbox"/> Other, specify:		
<b>TOTAL:</b>		<b>100%</b>

**10. Bibliography:**

1. N.Mohan, T.Robbins and T.Undeland (2003)Power Electronics: Converters, Applications and design, Wiley
2. A.I.Pressman, (1991) Switching Power Supply Design, McGraw-Hill,1991
- 3.Papers on Power electronics design available in internet.
4. Professor's notes

**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**

- |   |        |
|---|--------|
| 1. Apply Power Electronic fundamentals to the design of a power supply system that meets certain needs.   | (a)    |
| 2. Use of differential equations and small signal equations for modeling power converters and control circuits  | (a)    |
| 3. Use of engineering standards, preparation of a report describing the design process and selection of the optimal design to meet specifications and performance requirements  | (c)    |
| 4. 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. Comparison of different alternatives in order to present a responsible solution | (e)    |
| 5. Be aware of CIAPR and IEEE Code of Ethics  | -- (f) |
| 6. Proposal, project report and oral report   | (g)    |
| 7. 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)    |
| 8. Recognition of new developments in magnetic materials, power switching devices, design standards and design methods using information searching tools  | (i)    |
| 9. Students will understand current and emerging issues in the design of power electronic   |        |

**Map to Program Outcomes**

- systems
10. (j)
  11. Use of power electronics design tools, P-Spice and MATLAB-Simulink to complete the design and simulations (k)
  12. Be able to prototype to test design concepts of power circuits (b)  
(k)

Person(s) who prepared this description and date of preparation: Krishnaswamy Venkatesan.  
Submitted by: Lionel Orama (Power Committee) by means of Raúl E. Torres jun 08.