Course Title	Power Electronics				
Course Code	ECE340				
Course Type	Compulsory				
Level	Bachelor (1st Cycle)				
Year / Semester	3rd Year / 6th Semester				
Teacher's Name	Leonidas Koufopavlou				
ECTS	6	Lectures / week	3 hours / 14 weeks	Laboratories / week	N/A
Course Purpose and Objectives	The objective of this course is to expose students to the major power electronic concepts, from both system and component perspective. The course also provides the foundations for analysis and design of electronic circuits for conversion and control of electrical energy and further elaborates on the analysis of power electronics, considerations for design and the range of power electronic applications.				
Learning Outcomes	Upon succesful completion of this course students should be able to: • Identify the energy conversion needs of society and the purpose of power electronics • Differentiate between specific examples of electrical energy forms and the implications of each in power electronics • Analyse power electronic circuits and to determine the input-output function based on energy balance and energy conservation principles • Describe the operation and principles of different AC-DC and DC-AC and DC-DC converters • Identify switch control waveforms for DC-DC conversion and rectification and to plot output voltage or current waveforms for a converter circuit • Evaluate problems concerned with line and load regulation of power supplies • Explain the applications of power electronic circuits in residential, commercial, industrial and utility applications				
Prerequisites	ECE220, ECE320	Co-requisites	None		
Course Content	Introduction: Introduction to energy conversion principles and power electronic systems. Classification of power processors and converters. Power switch circuit analysis. Overview of semiconductor switch devices: Physical operating principles of power semiconductor devices (p-n junction diodes, Bipolar power junction transistors, Silicon Controlled Rectifiers/Gate Turn Off Thyristors and Power MOSFET's/Insulated Gate Bipolar Transistors). Current-voltage characteristics. Operational characteristics of practical devices (power losses, di/dt and dv/dt ratings, turn-on and off time, heat dissipation steady-state and transient current ratings).				

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<tr><td></td><td>Power electronic converters:
Generic power electronic conversion. AC-DC conversion (diode rectifier, inductive filtering, controlled rectifier, effect of line inductance. DC-AC conversion (pulse-width-modulation (PWM) and other switching schemes). DC-DC converters analysis (step-up, step-down, buck-boost, full-bridge) and applications. Problems of converters.

Motor drives:
Introduction to motor drives. Driver circuits and applications of power electronics.

Power supply:
Overview of switching power supplies. DC power supplies (fly-back, forward, and push-pull converters, switch control, protection and electrical isolation. Power conditioning and UPS. Power supply protection.

Application of power electronics:

Other applications of power electronics. Power factor correction units. Renewable energy sources. Energy storage systems.</td></tr>
<tr><td>Teaching Methodology</td><td>Face- to- face</td></tr>
<tr><td>Bibliography</td><td>N. Mohan, T.M. Undeland and W.P. Robbins, Power Electronics: Converters, Applications and Design, John Wiley & Sons

M.H. Rashid, Power Electronics: Circuits Devices and Applications, Prentice Hall

P.T. Krein, Elements of Power Electronics. Oxford University Press</td></tr>
<tr><td>Assessment</td><td><table><tr><td>Examinations</td><td>70%</td></tr><tr><td>Assignments/Lab</td><td>20%</td></tr><tr><td>Class Participation and Attendance</td><td>10%</td></tr><tr><td></td><td>100%</td></tr></table></td></tr>
<tr><td>Language</td><td>English</td></tr>
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