

Course Content

Course Title (English)	Power Integrity for System-in-Packages
Course Title (Chinese)	系統構裝電源完整度
Credit	3
Instructor	Prof. Ruey-Beei Wu 吳瑞北 教授
Outline	<p>System in package is usually constructed by millions of interconnects in multilayer structure to fulfill the signal transmission and power delivery between thousands of pads of multiple chips. Since the data rate of digital systems moves into 10Gbps or higher, the frequency spectrum spans from baseband to millimeter wave. The power delivery network encounters various problems due to the electromagnetic effects, which need be well addressed by suitable modeling, analysis, and design from both theory and practice, to maintain the quality of the power delivery network, i.e., power integrity (PI).</p> <p>The course includes</p> <ul style="list-style-type: none">Packaging Evolution and Fundamental Issues of Power IntegrityPower Delivery Network, Basics and AnalysisModeling for Planes, Circuit- and Discretization-BasedMultiple Planes and Co-modeling with Transmission LinesRational Function Method and MacromodelingSimulation using Signal Flow Graphs and ConvolutionsPI Example of Chip-Package-Board Co-modelingPI enhancement by DeCaps and EBGSSN Reduction Coding and EMI Mitigation DesignsPI Design Examples

	<p>系統構裝由多層多導體結構組成，由於數位系統發展使訊號傳輸已達數 Giga bps 甚至更高，其頻率成份已從涵括基頻到數 GHz 微波波段，因此系統構裝的電源分佈結構會面臨許多由於電磁效應產生的問題，需要建立適當的模型、分析與設計，以維持電源分佈的品質。課程將從理論與實際兩方面介紹同學各項觀念，含平行電板傳輸線理論、同步切換雜訊、巨模型化技術、目標阻抗設計及實例應用等。</p>
<p>Goal</p>	<p>The power delivery in system-in-package (SiP) will be heavily suffered from the simultaneously switching noise due to the plate resonance and coupling between transmission line and plane pairs. This course will explain the issues from the view point of electromagnetic fields and based on which, establish the circuit modeling and simulation analysis for the power delivery network.</p> <p>Practical examples for the PI modeling and improvement design will be provided to acquaint the students with the analog circuit analysis for integrated SiP power and signal design, and laid the foundation of the advanced research to continuously evolving development of high-speed digital systems.</p> <p>系統構裝使用多層結構提供晶片電源，電源分佈會受到平板共振、以及平板與傳輸線耦合的切換雜訊等因素影響，造成電源完整度的問題。本課程將從電磁場的角度介紹上述問題的成因，並利用電路的理論進行模型的建立及模擬分析，最後且以實例介紹改良設計方法，使電源分佈網路的電源品質可以改善，以了解類比電路設計及整合系統構裝的電源及訊號設計，進而建立研發高速數位系統的基礎。</p>
<p>English Teaching</p>	<p><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>
<p>Teaching Material</p>	<p><input checked="" type="checkbox"/> English <input type="checkbox"/> Chinese</p>