

## 國立清華大學第 8 屆傑出產學研究獎得獎人簡介



電機系吳財福教授

吳財福教授研究專長為電力電子，近五年著重於「直接數位控制」的發展，以因應轉換器元件之非理性和非線性，並且積極擴充至多功能三相轉換器。此控制可廣泛應用於綠色能源發電、電池儲能、充電站充/放電、電動車馬達驅動、電子馬達模擬和能量回收，以及各種需要高功率交/直流電的場合。吳教授進一步致力於發展高/低切頻諧和式轉換器，可以提升 40% 動態響應，同時降低 15% 系統體積。此外，吳教授也從事電漿的應用研究，開發「遠端電漿源」，用於半導體製程腔體之清洗用；開發 RF(13.56 MHz) 產生器，用於內視鏡滅菌；開發表面處理器，做為材料表面之先期加工處理。這些技術可以協助國內、外企業，發展高功率和高頻轉換系統，其貢獻顯著。

吳教授主持「精緻電力電子應用研究實驗室」，著重在轉換器拓樸結構、建模、控制，以及多功能轉換系統的研究，最近出版專書“Origin of Power Converters,” 「轉換器起源論」，透過轉化比擬機制，運用植物嫁接法、壓條法及 DNA 架構，有系統地推演轉換器拓樸結構，能夠將多位研究者花了近半世紀才試出來的 6 個基本轉換器，在 10 分鐘內就可以推演得到。吳教授曾獲得國科會/科技部兩次傑出研究獎，兩次特約研究計畫獎勵，教育部「產學合作獎」，中國電機工程學會「傑出工程教授獎」及國內、外 7 篇最佳論文獎；曾主編 IEEE Transactions on Power Electronics in DC Distribution Systems 專刊；目前為本校特聘教授。

Professor Tsai-Fu Wu received his Ph.D. from The University of Illinois at Chicago. His research expertise is Power Electronics. In the latest 5 years, Prof. Wu is mainly focused on development of direct digital control which can take care of non-ideal and nonlinear component characteristics in the power converters. He has been dedicated to design and application of three-phase multi-function converters, which can be widely applied to green power generation, energy storage, charging station, electric-vehicle motor driving, electronic motor emulation and energy recycling, and those which need high power conversion. Moreover, Prof. Wu has developed “harmonized high-low switching-frequency converters” for high power applications which can increase system dynamics by 40% and reduce system volume by 15%. Additionally, he has worked closely with industries to develop remote plasma source generators for chamber cleaning, RF (13.56 MHz) generators for endoscopy sterilization, and high-frequency plasma source for surface treatment. All of the developed techniques are useful for our industries with high-power/high-frequency applications, achieving the objective of energy saving and carbon reduction. They have profound impacts and significant contributions to our industries.

As the Director of Elegant Power Electronics Applied Research Lab (EPEARL), Prof. Wu guides his team on developing converter topologies, modeling and control, and multi-function converter system integration. In particular, he published a book entitled “Origin of Power Converters”, in which with the mechanisms of analogy and transformation, converter topologies can be evolved systematically with graft and layer techniques and DNA structure. With these techniques, the well-known six PWM converters can be derived in 10 minutes, which were obtained by many researchers spending around a half century with trial-and-error approaches. He received two Outstanding Research Awards from NSC/MOST, Industrial Co-op Research Award from MOE, Outstanding Engineering Professor Award from Chinese Electrical Engineering Society, 7 best paper awards from TaiPEA and International Conf. of PE Applications, and served as Editor-in Chief of a special issue of IEEE Trans. on PE in DC Distribution Systems. He is currently a Distinguished Professor of NTHU.