Project title: Versatile Power Electronics 'LEGO'

Faculty advisor: Hang Gao

Project description:

In power electronics education, students, especially undergraduates, are often challenged by experimental verification of newly developed topologies and controls. The reason is that based on different circuit topologies and applications, power electronics converters are highly customized in terms of the number of semi-conductor switching devices, installed passive components, and requirements on sampling and gating. Hence, it is extremely harsh for an inexperienced student to build up power electronics setup from scratch, which further compromises student's learning experience. In this project, we plan to develop a set of power electronics modules to build up different power converters like playing 'LEGO' bricks. The set of power electronics modules comprise of *switching device board, driver board, sampling board, and gating distribution board*. By creating various combinations of multiple power modules, different power converters can be flexibility and quickly constructed and tested, which will in turn strengthen student's interest in conducting power electronics experiments.

In this project, the student will be responsible for assembling, debugging, and testing power module boards under the faculty advisor's supervision. The advisor will provide power modules' schematics, PCB boards, components, and other tools. Through this project, the student will learn how to read circuit schematics using an online platform called 'EasyEDA', debug, and test circuits in accordance with schematics. Finally, the student will use completed power modules to assemble a voltage-source converter and obtain variable voltage and variable frequency outputs.

Deliverables:

1. Multiple switching device boards;
2. Multiple gate driver boards;
3. Two sampling boards;
4. One gate distribution board;
5. A build-up voltage-source converter.

Time requirements:

1. A total of 200 hours.
2. Mon-Frid, 10am-4pm, May 16 – Aug 5.

Constraints:

No specified constraints on the project.

Required skills and knowledge:

Interests in electronics; Commitment on playing with hardware.