Practical Ideas from Professors: Standards Education in Your Courses

Teaching Standards in Electromagnetic Compatibility

About the School of Engineering and Sustainable Development at De Montfort University

The School of Engineering and Sustainable Development is one of three schools in the faculty of Technology; the other two are the School of Computer Science and Informatics, and the Leicester Media School. As well as a strong general engineering focus, the School of Engineering and Sustainable Development also has a research focus on sustainability, with a broad spectrum of related research, including energy economics. The undergraduate curriculum of the school is mechanical engineering, mechatronics, electronic engineering, and physics. The electronic engineering, mechatronics, and physics students share a number of courses, one of which is the course on electromagnetics.

Using Standards in Technical Field Courses:

De Montfort University was incorporated as a university in 1992; immediately prior to that it was a polytechnic (Leicester Polytechnic). One aspect of polytechnic education that is still strong is the emphasis on skills development for the next phase of students' lives—whether that is a research career or an industrial one. Should students progress along the research path, an increasing emphasis in the United Kingdom is placed on the demonstration that the research has impact outside a purely research environment.

Prof. Alistair Duffy

Alistair Duffy has worked at De Montfort University in Leicester, United Kingdom, since 1994; prior to this he read for degrees at University College Cardiff, the University of Wales, and the University of Nottingham, and also worked in industry. He currently leads two research groups: the Centre for Electronic and Communications Engineering and the Advanced Manufacturing Processes and Mechatronics Centre. He has served two terms as a director-at-large of the IEEE Electromagnetic Compatibility (EMC) Society, and he is currently the chair of the EMC Society's Standards Development and Education Committee (SDECom). Alistair's research work has contributed to IEEE 1597.1™, IEEE Standard for Validation of Computational Electromagnetics, Computer Modeling and Simulations.

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Using Standards in Technical Field Courses (continued):

One vehicle for this is through the incorporation of that work in recognized standards. Should students follow an industrial career, they will need to understand the role of standards in their particular fields, and be aware of the importance of contributing to the development of these standards to ensure that their voices, or the voices of their employers (or industry groups), are heard. As a result, standards are introduced in the degree program simply as another technical resource, and not via formal lectures. This way, it is intended that any concerns individuals may have with the perceived amount of time and effort required for using potentially large documents to guide working practices can be overcome.

The electromagnetics module runs throughout the academic year (starting in October, with the final assessment in May). It is weighted 50:50 between the final examination and coursework. There are several components to the coursework, but the main component is a technical paper that is written following the IEEE Journals template. There are two parts to this coursework element. The first is focused on problem-based learning and requires students to develop knowledge and skills in electromagnetic simulation and the use of vector network analyzers and spectrum analyzers for various measurement tasks. The second part to the coursework is project-based learning, for which a design problem is set. Recent design problems have included planar Yagi-Uda arrays and Branch Line Couplers. The students are expected to design the components using full wave electromagnetic simulation software, to build the device, and then to compare the measurements against the predictions from the simulation software. It is in undertaking this comparison that standards are introduced.

One important question when comparing the real measurements with the simulations is: "How good is the agreement?" The second important question is: "How do you know?" It is as a means of answering these questions that IEEE Std 1597.1 is introduced. This standard addresses the comparison of simulated and measured data, primarily for the purpose of validation. The marking scheme for the final paper includes how the process of comparison has been performed and the critical analysis of the final designs and practical devices.