

Electromagnetic Education Session at IEEE AEMC 2017

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An Electromagnetic Education Session with the theme 'Opportunities and Challenges' was held on Thursday, December 21, 2017, as part of the 2017 IEEE Applied Electromagnetics Conference in Aurangabad, India. This session, organized by Krishnasamy T. Selvan, SSN College of Engineering, Kalavakkam, India and moderated by Raj Mittra, University of Central Florida, USA, had particular focus on electromagnetic education in India. The session featured short invited talks by R. K. Mishra, Berhampur University, Odisha, Debatosh Guha, Institute of Radio Physics, Kolkata, and Goutam Chatopadhyaya, National Aeronautics and Space Administration. The talks were followed by discussions among the attendees.

The following aspects/concerns were highlighted during the invited talks:

- Education aims to lead to a holistic development of students. Thus, besides its utilitarian values, education also strives to develop citizens that care for each other and for the environment. But given that excessive competition and thus pressure pervade industrial and academic activities, is there a threat to the very foundation of educational values? If yes, would it not affect all components of education, including electromagnetic education?
- Since employability in RF sector appears to be poor as of now, it is a challenge to have students enthused in electromagnetics and related subjects.
- Can the mathematical abstraction that is characteristic of electromagnetics help students link with practical attributes or soft skills necessary in profession?
- Will technological development being apparently in the direction of automation further affect job opportunities in RF?
- Challenges such as these result in universities shrinking space for electromagnetic theory in their curricula.
- Attracting good students to the field should be the priority of faculty.
- Use of simple mental constructions could greatly facilitate teaching and learning of certain topics such as rectangular waveguides.
- Undergraduate education is, and will remain, vital to quality research. Therefore adequate attention is required here.

- While internet can facilitate students acquire breadth of knowledge, it is a teacher that can give depth of knowledge. This being so, faculty must focus on quality of delivery.
- Since students in general attend to lectures when they find them interesting and are able to connect the subject to jobs, they are not to be blamed for the decreased interest presently shown to EM subjects. Thus an important aspect faculty have to constantly strive to address is 'conservation of attention' of students.

During the interactions that followed among the participants, the following ideas were expressed. While some were in response to the points above, others did not have any specific reference to them.

- The extensive abstraction that is characteristic of electromagnetic theory can be employed to discuss the scholarly attributes required of graduates. This has been discussed in some papers of one of the session co-chairs (for example, see [1]).
- If industries want to recruit RF engineers for simulation based design work, they will generally prefer undergraduates. If a more critical approach is desired, they may opt for graduates. Thus, for PhD's to be considered for industrial placement, they need to demonstrate substantially more capability than the above.
- Generally, interpretative ability is very important, given the extensive use simulation software tools find. However, at present, this ability is not often at desired level.
- Good teaching at undergraduate/graduate level can significantly influence more students to consider a career in electromagnetics and in related domains.
- Universities often have extensive syllabus to be covered in about 3 to 4 months' time, and this often impacts the quality of teaching.

In his concluding comment, Raj Mittra said an experiment or animation based teaching should significantly improve Em education and that faculty ought to move with times in changing their teaching styles.

Going by the experience of this session, it appeared that longer sessions that involved more leisurely interactions and discussions among the participants could help obtaining better understanding on the way to move forward in respect of improving EM education.

Reference:

1. K.T. Selvan and P. Wahid, "Electromagnetic theory teaching: Focusing beyond applications," Forum for Electromagnetic Research Methods and Application Technologies (FERMAT), vol. 12, 2015.