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Evaluation of the programme specification for the proposed Master of Science Degree in Electrical Power Systems

I have recently been asked to review the programme specification for an MSc in Electrical Power Systems that will be taught at African Center of Excellence in Energy for Sustainable Development (ACE-ESD) starting in the academic year of 2017-2018.

I have been a permanent member of the academic staff of the Dept. of Electrical and Electronic Engineering at Imperial College London since 2014 as a Lecturer and I also have the role of first year undergraduate course organiser and I partake in the management of an MSc course entitled “Future Power Networks and Smart Grids”. I hold a PhD in Electrical Engineering from the Universitat Politècnica de Catalunya (Barcelona), an MSc in Control Engineering and an undergraduate degree in Industrial Engineering from the same university. As a researcher, I am part of the Control & Power Research group in my department. My field of expertise is control and design of power electronic converters for energy generation, DC transmission and new applications to distribution. My current research focuses in low voltage distribution applications using DC but I have a track record on power electronics for wind power generation and HVDC transmission with special interest in the control of Modular Multilevel Converters. I am an associate editor of the IEEE Transactions on Sustainable Energy and a member of the Cigré B4.76 working group on DC-DC converters for HVDC applications.

The programme specification for the MSc in Electrical Power Systems was given to me as two separate documents entitled “*Programme Specification*” and “*Module Descriptors*”. The aim of the course is to provide a competitive specialised training for electrical power systems engineers that will take key technical and managerial roles in the power industry. The course is two years long organised in four semester blocks. Students take taught modules during the first three semesters and then work full time for six to eight months on an individual project starting close to the end of the third semester. The course includes a series of introductory modules that cover fundamentals on mathematics, circuit theory, power engineering and economic theory tailored for power systems engineering applications. These are followed by other modules on advanced topics.

The centre will take about 15 new students per year and there is a plan to involve an increasing teaching staff over a period of four years. The number of taught modules per semester is 6 and each module takes a student 100 hours (36 hours of contact time with lecturers and staff plus 64 hours of self-directed study). Further, each module requires about 146 hours from members of the staff including lecture/labs time, preparation and assessment. These figures are sensible and well aligned with the allocation for similar degrees in most universities.

In my view, the course contents are very well balanced. They cover the classic topics one would expect in a power systems MSc (e.g. dynamics, protections, etc) as well as elements other topics such as signal processing, communications, control systems and power electronics, which I believe are crucial to master given the technical challenges and opportunities future power engineers face.

The admission criteria states that the course is open not only to BSc electrical engineers but also to mechanical engineers and students from other fields. In my view, some of these students may lack the electrical background and could struggle to follow the course at the same pace as the rest of class. The weekly supervisory meetings included in the programme are a good addition and will be an effective way to identify these cases but I wonder if perhaps an informal technical interview as part of the admission process would be useful to identify potentially weak students as well.

The module descriptors in the programme specification are well detailed and include a summary of aims and objectives, learning outcomes, indicative contents and methodology. I was able to grasp what the lecturers would cover in each module and the only minor aspect I would suggest to improve in the descriptor is how the content (syllabus) of the modules is presented. A few modules describe the indicative contents in prose while others include a hierarchical list with various different notations (e.g. "part 1, part 2", "unit 1, unit 2", etc).

Regarding the master thesis/dissertation, the time allocation and the assessment criteria seems adequate but I also expected to see a description of how the student project allocation would be done; whether the students would be in charge of agreeing on a topic with their assigned supervisors or academics in the centre would be asked to propose the topics and students wouldn't get the chance to decide what they would be working on. Another thing I would like to point out is that MSc level projects take a significant amount of time to complete and they often lead to very impressive results. I often feel that universities don't disseminate enough the outcome of the student and I think it is a mistake because those projects could be a good way to advertise the courses and attract prospective students and researchers at national and international level.

The last thing I would like to point out is that renewable generation technologies have undergone an enormous development over the last few decades and they are widely acknowledged as fundamental for present and future sustainable generation of electricity with a very important role in the developing world where electrification is taking place. Having given a look at the programme, I have noticed that at least 5 of the modules cover different aspects of renewable generation (e.g. wind, PV) but this topic is not enough emphasised in the list of programme learning outcomes in the "*Programme Specification*" document. It would be good to revise the programme rationale, educational aims and learning outcomes of the aforementioned document to make sure it fairly reflects the content of the programme and make sure that no important elements are missed.

In conclusion, in my view the MSc Electrical Power Systems presents a well-balanced programme that covers a range of key areas future power engineers should master and I believe it will be well received by prospective students. The structure of the programme and the management plan are sound and I believe the programme will be a good instrument to train highly qualified power engineers in Rwanda and Africa. The comments attached above should be taken as recommendations rather than mandatory requirements and I would like to express my sincere best wishes to the organisers of the course and their prospective students.

Yours faithfully,



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