

# Teaching statement

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I am passionate about teaching. It gives me immense satisfaction and joy that I, as a professor, will have the privilege to take part in the initial stages of the students' journey. It will also provide me a platform for improving my own skills both in terms of expressing myself as well as be a great source of research ideas. Below, I describe in detail my experiences and ideas in teaching.

**Previous experience** I have started my teaching experience in 2006, just after my graduation from the faculty of engineering in 2005 (Assiut University, Egypt). I had the privilege of being a teaching assistant for several courses for undergraduate students at the Mechanical Engineering Department, Assiut University, Egypt. These courses include: Robotics and automation, Automatic Control I, Automatic Control II, Modeling and Simulation of Dynamic Systems, C++ Programming, Scientific Reports Writing, Engineering Analysis, and Mechatronics Laboratories.

After successfully completing my PhD in 2014 at the Université de Lorraine (Nancy, France), I have worked at the university as a research and teaching assistant for one year during which I have assisted in teaching mechatronics lab experiments to undergraduate students.

From July 2015 to October 2016, I have worked as a post-doctoral researcher at the Technical University of Eindhoven, Netherlands. During this period, I have assisted in the tutorial sessions of two graduate courses with Prof. Maurice Heemels, which are: Linear System Theory and Linear Algebra.

Since November 2016, I have been promoted as a lecturer at the Mechanical Engineering Department, Assiut University, Egypt. As a part of my position, I was responsible of preparing and giving lectures for several courses of undergraduate students including: Automatic Control I, Automatic Control II, Digital Control, Mechatronic System Design, Seminars in Mechatronics, C++ Programming, Scientific Reports Writing, Mechatronics Laboratories, and supervising mechatronics graduation projects. I was also responsible of teaching the graduate course "Advanced Automatic Control I" for master students. Also, I took the charge of teaching Automatic Control courses in other universities in Egypt, namely are: Minia University and

Information Technology Institute. I am also a supervisor on the thesis of two master students in the Mechanical Engineering Department, Assiut University, Egypt.

**Teaching philosophy** In my teaching efforts to this day, I always strive to provide the intuition behind the techniques and theories being presented, and to draw the students attention to the fundamental concepts underlying the material taught. In addition, when presenting basic mathematical concepts or abstractions, I seek to identify the potential applications of these concepts in the solution of real-world problems. This can help attract and uphold students' interest, which is, in my view, a crucial element of effective teaching. One of my goals as a teacher is to get students to think critically, instilling on them a taste for challenging what they are taught. As engineers and scientists we spend most of our time challenging established or perceived facts, and this is arguably the way we mature and manage to solve problems. Moreover, I favor an accessible and interactive teaching style that invites student participation. Guided class discussions that encourage the students to think of potential solutions to a given problem are a great tool, especially at the graduate level. I always strive to become a better teacher. I encourage students to express their comments about their progress, my teaching ability, and the way the course is structured by providing them the opportunity to formally evaluate these aspects. It is always a positive experience to address their concerns and make changes as needed. I put significant effort in creating an enjoyable classroom environment and usually develop friendly relationships with students, which is helpful in getting valuable feedback.

I am a strong believer of wedding research with the university's educational mission at both the graduate and the undergraduate levels. Given the opportunity, I think that most students would embrace with passion the possibility to work in research projects and learn invaluable skills in the process. Even though undergraduates have to be inculcated the core concepts of the field in the short span of five years, I think they could greatly benefit from closer interaction with faculty research projects. Class and stand-alone student projects are a good vehicle for this interaction conveying some of the excitement of research and serving as a bridge to graduate school or industry careers. When working with undergraduate students in a senior designs project at the University of Assiut, I was pleasantly surprised by their ability to understand and actually implement state-of-the-art projects. I also enjoyed mentoring graduate students and helping them to develop critical thinking as well as improve their research skills.

## **Teaching interests and plans**

Based on past experience, I found all aspects of teaching to be stimulating and rewarding: lecturing, interacting with the students, formulating problem sets, and lab experiments. As a junior faculty, I would be pleased to teach in basically all topics of the undergraduate/graduate Mechatronics Engineering curriculum. In particular, I have a solid background in Automatic Control, Robotics, Modeling and Simulation of Dynamic Systems, and Mechatronic system design, and C++ programming.

I would welcome the opportunity to teach basic topics such as Mathematics, Numerical Analysis, Programming, and Scientific Reports Writing. I would also enjoy directing lab and project courses in my areas of interest. At the graduate level, I would be interested in teaching and enhancing courses in Automatic Control, Robotics, and Optimization.

Moreover, I am keen on introducing an advanced-level graduate course focusing on the particular area of Multi-agent systems. Multi-agent systems allow the modeling of interacting processes between autonomous acting individuals in distributed systems while using compact software modules for deployment. On the one hand due to their modularity Multi-agent systems are very appropriate for the control of inter-enterprise processes that are common in logistics and supply chain management, on the other hand Multi-agent systems are suitable for the micro-simulation of socio-technical and economic processes.

I would also be interested in teaching a graduate level course (or seminar) focusing on the area of hybrid dynamical systems, in which both continuous-time dynamics and discrete-time dynamics are interacting, which induces new phenomena and require different techniques of modeling, analysis and simulation. Such kind of hybrid dynamics naturally appear in many applications such as control systems, projected dynamical systems, and dynamics social networks. The target audience is expected to be interdisciplinary, and accordingly the discussed methods will be illustrated through examples involving social, information, communication, control.

Finally, I like to say that we have to excel in research so that we have interesting things to share; and that we have to excel in teaching so that things we share actually sound interesting and compelling.

Sincerely Yours,

Mahmoud Abdelrahim