Teaching Statement: Osama Elshazly

I have 12 years of experience integrating teaching and research since I was a teaching assistant in 2005 till I have started my current position as an assistant professor in 2015. I taught my first graduate course in Robotics Engineering back in fall 2015. I have conducted my teaching and my research in mutually beneficial ways, and the synergy has paid off with better equipped students, new research collaborations, more productive students in my department, and about 4 years of teaching opportunity at the Department of Mechatronics Engineering; High Institute of Engineering and Technology (HIET); Ministry of High Education- Egypt. My teaching focus on research and system development requires that I teach not only the theory and application of current techniques, but also that I help my students gain a deep understanding of the big-picture concepts and deficiencies in the field of control of mechatronics systems, so that they will become well equipped leaders who can leverage the literature to develop new methods and systems that are actually relevant to mechatronics and robotics. Another key component of my teaching is complexity management, ranging from the breakdown of algorithms to the design of real-world systems. Together, these constructs are critical to thinking like a researcher and engineer, and so I explicitly incorporate them as early as possible into students' lives, even at the pre-college level, such as when I teach robotics to underrepresented minorities at some secondary schools in my small town. I am presently advising/supervising the research of two PhD students, two master students, and about seven undergraduate researchers. On fall 2017, I was deputed as an Assistant professor (Part-Time) at the Department of Mechanical Engineering; Université Française d'Egypte-Egypt. On fall 2019 till now, I was deputed as an Assistant professor(Part-Time) at the Department of Mechanical Engineering; Department of Mechanical Engineering; Faculty of Engineering-Modern University for Technology and Information (MTI)- Egypt. I am trying to maximize the public availability of my teaching materials, and for my methods in mechatronics and robotics courses. I am trying to have a complete set of teaching materials available online through my university website, including lecture slides, assignments, and professionally produced videos of all my lectures.

Philosophy & Style: My pedagogical style makes extensive use of class discussions and project work to foster a deep understanding of core concepts and the skills necessary to manage the complexity of modern mechatronics systems. When I initially present important underlying concepts and theoretical relationships, I prefer to utilize class discussion as the means of presenting the relevant underlying problem, with the goal that students understand (and appreciate!) why they are being presented with yet another algorithm, architecture, etc., before I ever put the details of it in front of them. I guide the discussion as necessary to lead the students naturally from initial understanding of the key aspects of the underlying problem to a critical analysis of potential solutions. My ultimate goal is for the students to pick up and run with the ideas, independently re-deriving the overall theory of what I am about to present in detail, thereby walking students through the

process of thinking like an expert researcher or engineer. I typically use quizzes to prompt and assess students' initial comprehension of new material, with follow-on mini-project homework assignments that are typically simplified real-world problems. A large, real-world final project gives students the experience they need to translate their coursework into the real world, using theory, techniques, and tools to identify, formulate, and solve scientific and engineering problems. I prefer projects with an element of interdisciplinary teamwork and collaboration, but with clearly delineated individual goals and responsibilities so that I can fairly evaluate each student. Projects provide a venue for students to begin looking up and teaching themselves the more minute details for their chosen methods, helping jump-start the habits of lifelong learning and literature search. Oral project presentations give students the opportunity (even if just for 5 minutes) to organize, present, and teach the key components of their projects, providing them critical experience with conference-style scientific or technical public speaking. I continually modify my course materials to take into account student feedback, new opportunities, and my own perceptions of course deficiencies, paying close attention to what students accomplish for their projects and what they report having learned from them.

Teaching Experience: I teach some undergraduate courses as an assistant professor at Faculty of Electronic Engineering- Menoufia University - Egypt (September 2015 - Now): Robotics Engineering- Real Time Control Systems - Introduction to Mechatronics - Control Systems Applications. Moreover, I am teaching some postgraduate courses such as Selected Topics in Robotics Engineering Course (Master Students) & Introduction to Robotics (Diploma). The cross-listed course not only elicits excellent student reviews, but I have also received an Outstanding Teaching invitation from Department of Mechanical Engineering; Université Française d'Egypte - Egypt to teach some undergraduate courses (Credit Hours) such as Process Control and Servo Systems Course (4th Level) & Artificial Intelligence techniques in Control Engineering (5th Level)as an adjunct professor. Furthermore, I was invited to be an assistant professor- part time- at Department of Mechatronics Engineering; High Institute of Engineering and Technology (HIET)- Ministry of High Education- Egypt to conduct some courses (Credit Hours) such as Mechatronics Systems Design - Introduction to Robotics - Dynamics of Machines and Robotics - Kinematics of Machines and Robotics - CNC Machines and Metal Cutting Processes- Advanced Control Engineering- Motion Control and Servo Systems- Biomechatronics. Finally, I have been invited as an assistant professor- part time- at Department of Mechanical Engineering; Faculty of Engineering-Modern University for Technology and Information (MTI)- Egypt to conduct some courses (Credit Hours) such as Robot technology and Control(5th Level), Mechatronics II (5th Level), and Modeling and Simulation of Industrial Systems (4th Level).

Most of such graduate courses are heavily based on projects that utilize some practical tools such as PLC and Microcontrollers and Raspberry Pi to tackle cutting edge problems in mechatronics and Robotics research. Class exercises included in the above courses require students to design, build, and run experiments in

software to empirically optimize their projects' algorithm architecture and parameter tuning. The courses repeatedly stresses the need to always consult the latest scientific literature when seeking to build useful systems, and makes use of current papers for some of the lectures. Students interact with practicing engineers to learn contemporary practice, workflow, and limitations within the robotics, control and mechatronics communities. In addition, the course has afforded me the opportunity to be involved with numerous additional graduate research projects, helping students develop novel methods ranging from building small prototypes to development of some models available to be manufactured in mass products. I was also member of the faculty Quality Assurance to update and/or include new courses syllabus to be consistent with the international courses bylaws delivered at international highly ranked universities.

I have 4 years of experience supervising some undergraduate students' teams who participate in some national competitions such as ROBOCON Egypt (2007-2009) and those which are related to robotics field in Egypt. Moreover, I was the supervisor of the Egyptian team participating in the international Autonomous Robot Racing Challenge (IARRC-16) - University of Waterloo-Canada (The Fourth of the participated teams from all over the World related to Technical Report) and the supervisor of the Egyptian team participating in the International Design Contest (IDC-Robocon2016) Bangkok-Thailand. During this supervision, I have transferring my experience to students for working in teams and utilizing some robot modules such as Lego Mindstorms and Robot C, students learn how to jointly develop a robot platform capable of performing in "real-world" conditions. The teams custom design, build, and program their robots to compete against each other, performing a variety of tasks including line following, avoiding obstacles, and automatically coloring in figures with markers. When finished, the students have experience with real-world C programming, an initial taste of complexity management for engineering, and the confidence that they can build nontrivial functional systems.

Finally, I have helped advise two Ph.D. students (Menoufia University), Two M.S. students, and multiple undergraduate researchers. I have also served on qualifier and thesis reviewer for other students, primarily those who have taken my methods in Mechatronics and Robotics Engineering. I was served as reviewer for some international Journals and conferences such as Journal of Intelligent and Robotic Systems. - Journal of Advances in Mechanical Engineering. - International Journal of Mechanisms and Robotic Systems. - IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). - IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM).