

## **Teaching Statement**

When I joined SUSTech in 2012, there are only around 40 students in this young university, who are all in the first year of their undergraduate (UG) study. The UG curriculum of SUSTech includes the first year of general purpose study, followed by three-year study on one specific program. I led the design of communications engineering program in 2012, and have revised the program curriculum each academic year according to the enlarging pool of courses in SUSTech and the feedbacks from students. Meanwhile, I have taught the courses of Signals and Systems, Communication Principles, Design of Communications Systems I, Information Theory and Coding, Introduction to Wireless Communications, Optimization of Wireless Communication Systems in the past six years, and supervised the final year projects of more than 30 UG students (Please refer to the Appendix A and B of this statement for the detailed descriptions). In the following, I shall summarize my teaching service via the aspects of curriculum design, teaching performance and project-centric learning.

### **Design of Program Curriculum**

Starting from a piece of blank paper, we are able to optimize the program curriculum and course syllabus by absorbing the latest concepts. Take the courses of Communication Principles and Wireless Communications as an example. In the conventional syllabus of these two courses, the laboratory session is mainly based on observation via the equipment of signal generator, oscilloscope and etc. This might be apart from the requirements of industry, where the ability to develop a system component or even a whole system is necessary. I introduced the software-defined radio as the experiment platform for the above courses, such that skills of system development in both software and hardware can be trained together with the ability to creatively apply the knowledge of communications engineering.

The conventional courses on communications, such as Communication Principles and Wireless Communications, focus on the interpretation of each communication technology. However, a practical communication system is a synergy of different technologies, full of design tradeoffs from many aspects. The above courses may not be able to provide the students a complete picture of a complicated system. Moreover, unlike the courses of programming languages and image processing, it is difficult for the students to use the learned communication technologies in real applications, due to the high threshold of communication system development. To address this

issue, one compulsory course is added in the program curriculum, namely Design of Communications Systems I. In this course, I use IEEE802.11 and LTE as examples to introduce the design considerations of practical systems. Specifically, the students would read the specifications of these systems, discuss on the key technologies used in these systems, use simulations to verify performance of the applied technologies. In addition, the students also have chance to implement real communication systems and design innovative applications, e.g., localization, via the software-defined radio.

### **Teaching Performance**

As a new university established in 2011, the quality of graduates has a strong and rapid impact on the university's reputation. I have been devoting myself to the teaching since I joined SUSTech. I have taught six different courses in the past six years due to the lack of teachers, and the students' satisfaction on my courses keeps improving. Taking the course of Signals and Systems as an example, it is about mathematical approaches to analyze and process signals. Although there may not be advanced mathematical techniques in this course, it is the entrance of a completely new area for most of the students, as they do not have any background on signal processing. The way of thinking they used in their past courses, e.g., Calculus, Physics, Chemistry and Biology, may not be suitable for this course. Realizing this, I tried to emphasize the internal logic and philosophy in the signal processing theory, in addition to the interpretation of mathematical derivations. It can be observed from the records of this course that, the students' performance on this course keeps improving. The students' marks on my taught courses are usually above 95 (the total mark is 100) after 2017, which is above the average level of the university. Because of my teaching performance, I was chosen by 16 students as their supervisor of final year project in 2018, which is essentially higher than the average levels of the university and the department.

### **Project-Centric Learning**

We encourage UG students to participate in research projects from their third year in SUSTech, which is a part of program curriculum. In fact, project-centric learning is the key part of new engineering education, where the students should integrate all the necessary knowledge, skills, facilities to achieve a research and development objective. It provides a complementary training to the course-based education. In my group, I provide two types of projects for each UG student: innovative research and development projects and academic research projects. The former is for

the students who would like to join industry eventually. I prepared software-defined radio platform for them to develop innovative systems on visible light communications (VLC), millimeter wave sensing and communications, indoor localization and etc. The students who joined these projects should first learn the new knowledge on the above areas by themselves, propose their designs to me, implement and demonstrate the design. Each project may last for two years, the first year is mainly for the students to learn the necessary knowledge, and the second year is on the system design and implementation (i.e., final year project). Most of the students participating in such projects have received good job positions from top companies of ICT industry. The academic research projects are for the students who would like to continue their study on PhD degree. The topics I chose for them are from my research, including wireless resource allocation and performance analysis. The students in these projects should learn more advanced mathematical tools, i.e., convex optimization and Markov Decision Process, formulate and solve problems by themselves. Some of these students have published academic papers on good conferences and journals (Please refer to the Appendix C for the publication list).

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### Appendix A: The Courses I have taught

	2013-Spring	2013-fall	2014-Spring	2014-fall	2015-Spring	2015-fall	2016-Spring	2016-fall	2017-Spring	2017-fall	2018-Spring	2018-fall	2019-Spring	2019-fall
<b>EE205:Signals and Systems</b> (2 Lecture Credits + 1 Lab Credit, UG Compulsory)	Lecture + Lab	Lecture + Lab		Lecture + Lab		Lecture + Lab		Lecture		Lecture		Lecture	Lecture	Lecture
<b>EE206:Communication Principles</b> (2 Lecture Credits + 1 Lab Credit, UG Compulsory)			Lecture		Lecture		Lecture		Lecture		Lecture			
<b>EE314:Design of Communications Systems 1</b> (2 Lab Credits, UG Compulsory)									Lab		Lab		Lab	
<b>EE411:Information Theory and Coding</b> (2 Lecture Credits, UG Optional)								Lecture		Lecture		Lecture		Lecture
<b>EEE5028:Introduction to Wireless Communications</b> (2 Lecture Credits + 1 Lab Credit, PG Optional)								Lecture						
<b>EEE5026:Optimization of Wireless Communication Systems</b> (3 Lecture Credits, PG Optional)									Lecture					

## Appendix B: Number of UG and PG Students under My Supervision

Year of Graduation	2016	2017	2018	2019
Student Number	2 UG	8 UG	8 UG + 2 PG Master	16 UG + 1 PG Master

## Appendix C: Achievements of Project-Centric Learning

1. Q. Lan, B. J. Lv, **R. Wang**, K. B. Huang and Y. Gong, "Adaptive Video Streaming for Massive MIMO Networks via Novel Approximate MDP and Reinforcement Learning Methods", submitted to *IEEE Transactions on Wireless Communications*. (under major revision)
2. B. J. Lv, L. X. Huang and **R. Wang**, "Joint Downlink Scheduling for File Placement and Delivery in Cache-Assisted Wireless Networks with Finite File Lifetime," *IEEE Transactions on Communications*, vol. 67, no. 3, pp. 2274-2293, March 2019.
3. B. Lv, **R. Wang**, Y. Cui, and H. Tan, "Joint optimization of file placement and delivery in cache-assisted wireless networks," *2018 IEEE Global Communications Conference (GLOBECOM)*, Dec. 2018, pp. 1–7.
4. Z. Zhang, Y. Li and **R. Wang**, "Rate Adaptation of D2D Underlying Downlink Massive MIMO Networks with Reinforcement Learning," *2018 IEEE Global Communications Conference (GLOBECOM)*, Dec. 2018, pp. 1–7.
5. B. Lv, L. Huang and **R. Wang**, "Cellular Offloading via Downlink Cache Placement", *2018 IEEE International Conference on Communications (ICC)*, May 2018, pp. 1-7.
6. Z. Zhang, **R. Wang**, Z Zhou and Y. Li, "Downlink Goodput Analysis for Massive MIMO Networks with Underlaid D2D", *2017 IEEE Global Communications Conference (GLOBECOM)*, Dec. 2017, pp.1-6.