Lecture Series by Professor Supriyo Bandyopadhyay

Electrical and Computer Engineering
Virginia Commonwealth University
Richmond, VA 23284, USA

Introduction to Spintronics

DATE	DAY	VENUE	TIME	SESSION	TOPIC
25-06-2018	Monday	Fermion	11:00 - 12:00 12:15 - 13:15	Lecture 1	1. The semi-classical concept of an electron's spin a. Kronig Uhlenbeck model b. Stern-Gerlach experiment 2. Quantum mechanical operator for "spin": Pauli matrices and "spinors" 3. Dirac and Pauli equations
			14:30 - 15:30	Tutorial 1	
27-06-2018	Wednesday	Fermion	11:00 - 12:00 12:15 - 13:15	Lecture 2	4. Rotations on the Bloch sphere 5. Evolution of a spinor on the Bloch sphere a. Spin flip b. Rabi oscillations
			14:30 - 15:30	Tutorial 2	
29-06-2018	Friday	Fermion	11:00 - 12:00 12:15 - 13:15	Lecture 3	6. Spin-orbit interaction a. Atomic b. Rashba c. Dresselhaus 7. Spin Hall effect 8. Spin relaxation in a solid a. D'yakonov-Perel' b. Elliott-Yafet c. Bir-Aronov-Pikus d. Hyperfine interactions with nuclear spins
			14:30 - 15:30	Tutorial 3	
02-07-2018	Monday	Fermion	11:00 - 12:00 12:15 - 13:15	Lecture 4	9. Spin transistors a. Datta-Das transistor b. Other types of SPINFETs c. Spin bipolar junction transistors
			14:30 - 15:30	Tutorial 4	
04-07-2018	Wednesday	Fermion	11:00 - 12:00 12:15 - 13:15	Lecture 5	11. Spin based quantum computing
			14:30 - 15:30	Tutorial 5	

About the Professor

Supriyo Bandyopadhyay is Commonwealth Professor of Electrical and Computer Engineering at Virginia Commonwealth University where he directs the Quantum Device Laboratory. Research in the laboratory has been frequently featured in national and international media (newspapers, internet blogs, magazines such as Business Week and EE Times, CBS, NPR, journals such as Nature and Nanotechnology, and internet news portals). Inventions made in this laboratory have been highlighted in the US Army Nanoscience Poster prepared for the Pentagon and have resulted in multiple patents. The laboratory's educational activities were featured in a pilot study conducted by the ASME at Pennsylvania State University. The laboratory has graduated many outstanding Ph.D.s who have become internationally recognized faculty members and won numerous national and international awards.

Prof. Bandyopadhyay was named *Virginia's Outstanding Scientist* by Virginia's Governor Terence R. McAuliffe in 2016. His alma mater, the Indian Institute of Technology, Kharagpur, India named him a distinguished alumnus in 2016. His current employer Virginia Commonwealth University bestowed upon him the Distinguished Scholarship Award (given annually to one faculty member in the University) in 2012 and the University Award of Excellence (the highest honor the University can bestow on a faculty member) in 2017. His department gave him the Lifetime Achievement Award for sustained contributions to scholarship, education and service (one of two given in the department's history). His earlier employer, University of Nebraska-Lincoln, conferred on him the College of Engineering Research Award (1998), the College of Engineering Service Award (2000) and the Interdisciplinary Research Award (2001) given jointly by the College of Engineering, the College of Science, and the Institute for Agricultural and Natural Resources. In 2018, he received the *State Council of Higher Education for Virginia Outstanding Faculty Award*. This is the highest award for educators in private and public universities in the State of Virginia and recognizes outstanding scholarship, teaching and service.

Prof. Bandyopadhyay has authored and co-authored nearly 400 research publications and presented some 150 invited talks and colloquia across four continents. He has also authored/co-authored three classic textbooks that have taught the field of spintronics and quantum device theory to hundreds of thousands of students across the world. He is currently a member of the editorial board of nine international journals and served in the editorial boards of four other journals in the past. He is a current member and past chair of the Institute of Electrical and Electronics Engineers (IEEE) Technical Committee on Spintronics (Nanotechnology Council) and the Technical Committee on Compound Semiconductor Devices and Circuits (Electron Device Society). He was an IEEE Electron Device Society Distinguished Lecturer (2002-2012), and is currently an IEEE Nanotechnology Council Distinguished Lecturer. He is also a past Vice President of the IEEE Nanotechnology Council and had served in many administrative standing committees of that Council in the past. Currently, he serves in the IEEE Fellow Committee.

Prof. Bandyopadhyay is a Fellow of the Institute of Electrical and Electronics Engineers, the Institute of Physics, American Physical Society, the Electrochemical Society and the American Association for the Advancement of Science.