



SHORT TERM COURSE

On

WIRELESS INFORMATION AND POWER TRANSFER FOR ADVANCED WIRELESS COMMUNICATION SYSTEMS

(8th – 31st January, 2020)

Sponsored by:

Scheme for Promotion of
Academic and Research
Collaboration (SPARC)

Organized by:

Department of Electronics and
Communication Engineering,
NIT Tiruchirappalli, India

Collaboration with:

National Research Tomsk
Polytechnic University,
Russia

About SPARC:

Scheme for Promotion of Academic and Research Collaboration (SPARC) is a Ministry of Human Resource Development (MHRD), GOI initiative to improve research ecosystem in India. It supports national premier educational institutions by facilitating academic and research collaborations between Indian institutions and the best and selected institutions across the world's 28 nations. It encourages international faculty, Indian institution visits and long-term stays to teach courses and conduct workshops for the benefit of Indian researchers and students in the selected research area.

About TPU- Russia:

The Tomsk Polytechnic University (TPU), Russia is ranked at 387 in QS world rank and is ranked as 10th in Russia. It has 277th place in the world in the direction of "Engineering and Technology" as of QS ranking and 201-250 place in the world in the discipline "Engineering: mechanics, aviation, production" and Chemistry. TPU is the first engineering school in Russia's Far East to open doors in 1896. Today TPU is one of Russia's leading public research universities with focus on applied science and technology. TPU is a research university with a strong tradition of excellence in the areas of physics, applied engineering, and electronics engineering. Recently, we added nanotechnologies and alternative energy to our research portfolio. Tomsk Polytechnic's annual research budget of \$30 million ranks second among technical and engineering schools in the country. Roughly 10% of funding comes from outside Russia; we rank second to none in this category.

Key Resource Person:

Prof. DUSHANTHA NALIN K JAYAKODY,



(S'09, M'14, SM' 18) received the Ph. D. degree in Electronics, Electrical, and Communications Engineering, from the University College Dublin, Ireland in 2014. He received his MSc degree in Electronics and Communications Engineering from the Department of Electrical and Electronics Engineering, Eastern Mediterranean University, Turkey in 2010 (under the University full graduate scholarship). From 2014 - 2016,

he was a Postdoc Research Fellow at the Institute of Computer science, University of Tartu, Estonia and Department of Informatics, University of Bergen, Norway. From 2016, he is a Professor at the School of Computer Science & Robotics, National Research Tomsk Polytechnic University (TPU), Russia.

Prof. Jayakody has published over 120 international peer reviewed journal, conference papers and books. His research interests include PHY and NET layer prospective of 5G communications technologies such as NOMA for 5G etc, Cooperative wireless communications, device to device communications, LDPC codes, Unmanned Ariel Vehicle etc. Prof. Jayakody is a Senior Member of IEEE and he has organized or co-organised more than 20 workshops and special sessions of various IEEE conferences. He also served as chair, session chair or technical program committee member for various international conferences, such as IEEE PIMRC 2013-2019, IEEE WCNC 2014-2018, IEEE VTC 2015-2018 etc. He currently serves as an Area Editor the Elsevier Physical Communications Journal, MDPI Information journal and Wiley Internet of Technology Letters. In his career, so far, he has attracted nearly 6M \$ research funding. Also, he serves as a reviewer for various IEEE Transactions and other journals.

Eligibility:

The programme is open to UG, PG and Ph.D. Scholars of Electronics and Communication Engineering and allied disciplines of National Institute of Technology, Tiruchirappalli.

Course Coordinators:

Dr. P. Muthuchidambaranathan, Professor, ECE Dept.

Dr. G. Lakshmi Narayanan, Professor, ECE Dept.

Dr. G. Thavasi Raja, Assistant Professor, ECE Dept.

To Register click on the below link :

https://docs.google.com/forms/d/e/1FAIpQLSenG6-pxWqtJXQsrRrHxJaTXpucbxfIQomGMCJG2BKoEWjLIw/viewform?usp=sf_link

Last date of Registration 06.01.2020

For any clarifications, please contact:

Mr. Anandpushparaj. J, Mobile: 9092085186

Ms. Mitali Gupta, Mobile: 9731188359

Mail id: sparc145nitt@gmail.com

Course Outline

Name of course:	Wireless Information & Power Transfer for Advanced Wireless Communications Systems
Course level:	UG (Final Year), PG (any year),
Instructor:	Prof. Dushantha Nalin K. Jayakody
Teaching Assistants	Mr. Anandpushparaj. J, Mr. Balaji. D, Mr. Furqan Ali. M, Mr. Hassan Hyder
Discipline:	Electronics & Electrical Engineering/ Telecommunications Engineering
Lecture hours:	20 hrs
Pre-requisites:	Module on Digital Communications

Course Description:

The energy efficient communication system is of today's need in response to exponentially increased connected devices and energy-hungry mobile based applications. Thus far, researchers naturally focus on alternative energy harvesting techniques to support "**Green communication**". Lately, there has been a new trend to use the radio frequency (RF) signal for transferring power and transmitting information simultaneously. This more reliable and predictable way to harvest energy. A simultaneous wireless information and power transfer (SWIPT) system transfers the power of the signals to support its own operations and is less dependent on external power supplies.

This module deal with high-level overview of various wireless EH schemes. The module introduced several EH assisted communication design principals, current state of the art and the future research directions in this area. The students will be encouraged to work with small hands on experience to design some EH enabled communication systems to motivate them towards research area.

Lecturer Hrs – 16

Project support – 04

Self-study hrs – 40 hrs

Course Contents (# of lecture hours)

Topic	Contents	# of hours
1	Introduction to RF Energy Harvesting (RF-EH)	1
2	Main EH Schemes	1
2	Wireless Power Transfer	2
3	Introduction to Simultaneous wireless information and power transfer	2
4	Simultaneous Wireless Information and Power Transfer based System Design	2
5	Full-duplex wireless-powered communications	2
6	Wirelessly Powered Drones Networks	2
7	Interference Exploitation in RF-EH	1
8	Future Directions of SWIPT/RF EH	1
	Tutorial 01	1
	Tutorial 02	1

Project component (if relevant)

No	Brief Description	# of hours
1	Design SWIPT assisted communication system	02
1	Design of an wirelessly powered IoT application	02

Reference:

- Dushantha Nalin K. Jayakody, John Thompson, Symeon Chatzinotas, and Salman Durrani "Wireless Information and Power Transfer: A New Green Communications Paradigm", Springer-Verlag New York, USA, April 2018.
- T. D. P. Ponnimbaduge, Dushantha Nalin K. Jayakody, S. K. Sharma, Symeon Chatzinotas, Jun Li, "Simultaneous Wireless Information and Power Transfer (SWIPT): Recent Advances and Future Challenges", IEEE Communications Survey and Tutorials, Jan, 2017.
- Hucheng Sun, Far-Field Wireless Power Transmission and Ambient RF Energy Harvesting: Concepts, Designs, Applications, Scholars' Press (August 7, 2015).