



# INTRODUCTION TO WIRELESS AND CELLULAR COMMUNICATIONS

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**INTENDED AUDIENCE :** B.E. / B.Tech/ M.E./ M.Tech/ Ph.D. students who have completed digital communications

**PRE-REQUISITES :** Analog and Digital Communications, Digital Signal Processing

**INDUSTRIES APPLICABLE TO :** All wireless and cellular companies such as Qualcomm, Ericsson, Tejas, Samsung, Sasken, Intel, Texas Instruments, Motorola, Ittiam, Aruba, MoJo Networks.

## **COURSE OUTLINE :**

An in-depth understanding of the wireless channel and the related impairments (multipath, fading), small-scale and large-scale propagation effects, Understanding of the design of cellular systems, Detailed discussion of Multiple Access (TDMA/CDMA/OFDM), Antenna diversity, MIMO, Wireless Channel Capacity, Computer simulations of wireless systems, Exposure to current and emerging wireless and cellular systems (LTE, 802.11).

## **ABOUT INSTRUCTOR :**

Prof. R. David Koilpillai received the B.Tech degree in Electrical Engineering from the Indian Institute of Technology Madras and the M.S. and Ph.D. degrees in Electrical Engineering from the California Institute of Technology, Pasadena, CA. In June 2002, David joined the EE faculty of IIT Madras. He is currently the Qualcomm Institute Chair Professor in EE and Dean (Planning). During the period April 2008 – December 2009, he served as the Co-Chair of the IITM special Task Force for setting up the new IIT at Hyderabad. David also served as Head, Central Electronics Centre of IITM during 20010-11. David's technical areas of expertise include cellular and broadband wireless systems, and DSP techniques for wireless communications. He is the Faculty Coordinator of the IITMSAT Student Satellite initiative. During January – July 2007, David was on sabbatical from IITM and served as the Chief Scientist, Centre of Excellence in Wireless Technology (CEWiT), a public-private R&D initiative of the Govt. of India, and was responsible for launching the national project – Broadband Wireless Consortium of India (BWCI). Prior to joining IITM, David was at General Electric Corporate R&D for four years and Ericsson USA for eight years, where he held different technical and managerial positions. In 2000, he became the Director of the Ericsson's Advanced Technologies and Research Department at RTP, North Carolina, developing GPRS/EDGE handset technology. David's technical contributions at GE and Ericsson have resulted in 32 US patents, 10 Canadian Patents and 19 WIPO/European patents. In 1999 David received the "Ericsson Inventor of the Year" award, the highest technical recognition within Ericsson. In Nov 2003 David was elected Fellow of the Indian National Academy of Engineering. In 2014, David received the Srimathi Marti Annapurna Gurunath Award for Excellence in Teaching (Best Teacher Award of IIT Madras) David's current technical activities are in the areas of Cellular evolution - 4G and 5G, Smart grid Communications, DSP for High Speed Coherent optical communications

## **COURSE PLAN :**

**Week 01 :** Overview of Cellular Systems and evolution 2g/3G/4G/5G

**Week 02 :** Cellular Concepts – Frequency reuse, Cochannel and Adjacent channel Interference, C/I, Handoff, Blocking, Erlang Capacity

**Week 03 :** Wireless propagation Part 1 - Link budget, Free-space path loss, Noise figure of receiver

**Week 04 :** Wireless propagation Part II - Multipath fading, Shadowing, Fading margin, Shadowing margin,

**Week 05 :** Antenna Diversity

**Week 06 :** Wireless Channel Capacity

**Week 07 :** MIMO

**Week 08 :** CDMA Part I

**Week 09 :** CDMA Part II

**Week 10 :** OFDM and LTE Part I

**Week 11 :** OFDM and LTE Part II

**Week 12 :** Large Scale Propagation effects and Channel Models