DISCRETE TIME SIGNAL PROCESSING

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PRE-REQUISITES : None (some background in signals and systems might help though)

INTENDED AUDIENCE : Academic and Industrial Professionals; Core Course; UG & (PG students can take it as a refresher course);B.Tech/M.Tech

INDUSTRIES SUPPORT : Industries working in communications, speech and audio processing, instrumentation etc.

COURSE OUTLINE :

This course can in short be called "DSP revisited". It is seen that even though DSP is taught as part of UG curriculum in all engineering colleges, often the concepts are not taught very well, leading to huge gaps in understanding of the basics. The purpose of this course is to provide a guided tour of the key issues of DSP where every effort will be made to reinforce the basic concepts involved. Towards this, many new aspects and interpretations will be presented that are usually not covered in books.

ABOUT INSTRUCTOR :

Prof. Mrityunjoy Chakraborty obtained Bachelor of Engg. from Jadavpur university, Calcutta, Master of Technology from IIT, Kanpur and Ph.D. from IIT, Delhi. He joined IIT, Kharagpur as a faculty member in 1994, where he currently holds the position of a professor in Electronics and Electrical Communication Engg. The teaching and research interests of Prof. Chakraborty are in Digital and Adaptive Signal Processing, VLSI Signal Processing, Linear Algebra and Compressive Sensing. In these areas, Prof. Chakraborty has supervised several graduate theses, carried out independent research and has several well cited publications. Prof. Chakraborty is currently a senior editorial board member of the IEEE Signal Processing Magazine and also of the IEEE journal of Emerging Techniques in Circuits and Systems. Earlier, he had been an Associate Editor of the IEEE Transactions on Circuits and Systems, part I (2004-2007, 2010-2012) and part II (2008-2009), apart from being an elected member (also currently the chair) of the DSP Technical Committee (TC) of the IEEE Circuits and Systems Society, a guest editor of the EURASIP JASP (special issue), track co-chair (DSP track) of ISCAS 2015 & 2016, Gabor track chair of DSP-15, and a TPC member of ISCAS (2011-2014), ICC (2007-2011) and Globecom (2008-2011). Prof. Chakraborty is a co-founder of the Asia Pacific Signal and Information Processing Association (APSIPA), is currently a member of the APSIPA BOG and also, served as the chair of the APSIPA TC on Signal and Information Processing Theory and Methods (SIPTM). He has also been the general chair and also the TPC chair of the National Conference on Communications – 2012. Prof. Chakraborty is a fellow of the National Academy of Science, India (NASI), and also of the Indian National Academy of Engineering (INAE). During 2012-2013, he was selected as a distinguished lecturer of the APSIPA.

COURSE PLAN :

Week 1: Discrete Time Signals and Systems

Week 2: DTFT, Relation between DTFT and Analog Fourier Transform

Week 3: Rational Systems, Z-transform and Pole-Zero Models

Week 4: IIR Filter Design

Week 5: FIR Filter Design, Filter Structures

Week 6: Basics of Multirate Signal Processing

Week 7: Discrete Fourier Transform, Circular Convolution

Week 8: Fast Fourier Transform