INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DESIGN AND MANUFACTURING (IIITD&M) KANCHEEPURAM

Course Title	Digital Filter Design	Course No	To be allotted later on by the office		
Specialization	Electronics Engineering	Structure (IPC)			
Offered for	PG and Ph D	Status	Core ☐	Elective	■
Pre-requisite	Digital Signal Processing	To take effect from			
Objectives	This course covers the techniques and gain proficiency of modern digital filter designing techniques that are fundamental to a wide variety of application areas				
Course Outcomes	• Students will learn the essential advanced topics in DSP that is necessary for successful Postgraduate level research. • Students will have the ability to solve various types of practical problems in DSP				
Contents of the course *(With approximate break up of hours)*	**Introduction**: Importance of filtering and its applications, different types of filters, Analog vs. Digital, general filters specifications, basic designing examples. (3) **Filter Design**: Basic terminology, Butterworth vs. Chebyshev, Differential mapping and transformations from analog to digital. (3) **IIR filter design**: mapping characteristics, Attenuation characteristics, Higher order Butterworth filters, Introduction to Type I & II Chebyshev filters, Design of higher order Chebyshev filters with examples. (6) Impulse Invariant Technique (IIT): Effects of IIT, Higher order examples, Matched Z transform, need for pre-warping in BLT method. Analog and Digital Filter Transformations: General Principles, Different transformations, examples of higher order, Tunable filters. (8) **FIR Filter Design**: Introduction and design techniques employing different methods, Linear Phase FIR, Frequency response of higher order type, need for windowing and design of FIR with different windowing techniques, Hilbert transform, Gibbs phenomenon, Modern window techniques, least square designing example, frequency sampling examples. (14) **Quantization Effects**: Review of digital filter design, realizations, finite word length effects, root locations constraints, effects of coefficient quantization, fixed point arithmetic, Noise calculations, effects of scaling and examples for various scaling strategies. (8)				
Text and References	**Textbook** Digital Filters and Signal Processing by Leland B. Jackson, 3rd edition, 1996, Kluwer Academic, Boston, MA. **References** Theory and Application of Digital Signal Processing by Lawrence R. Rabiner and Bernard Gold, 1975, Prentice-Hall of India Pvt. Ltd., New Delhi. Digital Filters: Analysis, Design, and Applications by Andreas Antoniou, 2nd edition, 1993, Tata McGraw-Hill Publishing Co. Ltd., New Delhi. Digital Signal Processing by Andreas Antoniou, 2006, Tata McGraw-Hill Publishing Co. Ltd., New Delhi. Digital Signal Processing by Sanjit K. Mitra, 3rd edition, Tata McGraw-Hill Publishing Co. Ltd., New Delhi. Statistical Digital Signal Processing and Modeling by Monson H. Hayes, 2001, John Wiley & Sons, New York, NY.				