**20EE41E5 – DIGITAL SIGNAL PROCESSING**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course category:** | Professional Elective | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture - Tutorial - Practical:** | 3 - 0- 0 |
| **Pre-requisite:** | Signal & System, Fourier transform, Laplace Transform & Z transform | **Sessional Evaluation :**  **External Evaluation:**  **Total Marks:** | 40  60  100 |

|  |  |  |
| --- | --- | --- |
| **Course**  **Objectives** | Students undergoing this course are expected to: | |
| 1. Learn the basic concepts and analytical methods of Z-transform.  2. Learn to write various DFT & FFT algorithms.  3. Learn to introduce techniques and tools for digital filter structures.  4. Learn the design of FIR filters.  5. Learn about various IIR filters.  6.Learn truncation and rounding errors & quantization noise | |
| **Course Outcomes:** | Upon successful completion of the course , the students will be able to: | |
| **CO1** | Understand the concept of Z-transform and its properties. |
| **CO2** | Describe the use of DFT in linear filtering |
| **CO3** | Apply the fast fourier transform algorithm in different applications |
| **CO4** | Design the IIR filters and FIR filters for given specification |
| **CO5** | Design the IIR filters from analog filters for given specification and design the discrete–time systems. |
| **CO6** | Understand the truncation, rounding errors and quantization noise |
| **Course**  **Content:** | **UNIT – I**  **Review of discrete signals & systems:** Z-transform and Inverse Z-transform- theorems and properties- system function-fourier representation of finite duration sequences.  **UNIT – II**  **Discrete & Fast Fourier Transform**: DFT, properties of DFT- FFT- FFT algorithms-use of DFT for fast computation of convolution- IDFT.  **UNIT – III**  **Digital filter structures:** Basic FIR structures, IIR structures, direct form-I-direct form-II-parallel form-cascade form lattice structure-lattice-ladder structures.  **UNIT – IV**  **Design of IIR filters:** Properties of analog filters- frequency domain filter models-butter- worth-chebyshev and other approximations, filter design data- low pass to high-band pass and band stop transformation-filter response curves.  **UNIT – V**  **Design of FIR filters**: Fourier series method- windowing- sampling.  **UNIT-VI**  **Finite word length effects**: Fixed point and floating point number representations, truncation and rounding errors, quantization noise, coefficient quantization error, product quantization error, overflow error, round-off noise power, limit cycle oscillations due to product round off and overflow errors. | |
| **Text books**  **&**  **Reference books:** | **TEXT BOOKS:**  1.“Digital signal processing”, by A.V Oppenheim and R.W. Schafer, Prentice – Hall of India.  2.“Digital signal processing”, by S. Salivahanam – TMH.  3.“Digital signal processing Computer Base Approach”, by S.K. Mitra – Tata McGraw-Hill (III)  **REFERENCE BOOKS :**  1.“Digital signal processing”, by P. Ramesh Babu, Scitech Publications.  2.“Digital signal processing”, by John G Proakis and monolokis – Wiley Eastern Economy edition. | |
| **e-Resources** | 1. <http://nptel.ac.in/courses> 2. <https://dspace.mit.edu/handle/1721.1/57007> 3. http://dl.acm.org/citation.cfm?id=562622 | |