**20EE41E5 – DIGITAL SIGNAL PROCESSING**

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| **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:** | 4060100 |

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| **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
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