

## COURSE PLAN AND EVALUATION PLAN

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|------------------------------|--------------------------|-------------------------|--|
| 1. Course Code:              | CE725                    | 2. Course Title:        | ADVANCED DSP                                 |
| 3. L – T – P:                | <b>3-1-0</b>             | 4. Credits:             | <b>4</b>                                     |
| 5. Pre-requisite:            | <b>DSP &amp; DSP Lab</b> | 6. Teaching Department: | <b>Electronics &amp; Communication Engg.</b> |
| 7. Course Instructor:        | <b>Dr SUMAM DAVID S.</b> |                         |  |
| 8. Objectives of the Course: |                          |                         |  |

*At the end of the program the student must be able to*

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| <ul style="list-style-type: none"> <li>• analyze the behavior of discrete-time systems in time, frequency and transform domain</li> <li>• appreciate multi-rate digital filters</li> <li>• use spectral estimation techniques for system modeling</li> </ul> | <ul style="list-style-type: none"> <li>• have an appreciation of the potential applications of DSP in various fields</li> <li>• appreciate the principle and applications of filter banks</li> <li>• Relate theoretical concepts to practical applications</li> </ul> |
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### 8. Course Coverage (40 Lecture Schedule) :

Module	Contents	Objectives	Lecture	Evaluation
Introduction & Review of DSP	Introduction to ADSP – Objectives of the course, motivation, course plan, evaluation method, references	• Appreciate the relevance of the course	<b>L1</b>	
	Review of time-domain, frequency domain and transform domain analysis of discrete-time signals and systems, FS, DFS, FT, DTFT, DFT, FFT, Relationship between the three domains – $h(n)$ , $H(z)$ , $H(\omega)$ Characteristics of digital filters, Filter design – FIR and IIR	• Review of DSP	<b>L2-L7</b>	<b>Application</b>
	<i>Assignment I</i>			
Speech processing	Speech Production, digital models for speech production. Speech perception, auditory masking, models for speech perception. Speech Analysis – Time and frequency domain analysis of speech, speech parameter estimation, Speech compression, Speech Enhancement	• Application of signal processing algorithms in speech processing	<b>L8-L13</b>	<b>Application</b>
	<i>Assignment II</i>			
Power Spectral Estimation	Power spectral estimation – Classical techniques for spectral estimation, Parametric methods for spectral estimation, Higher order spectral estimation	• Apply spectral estimation techniques for communication applications	<b>L14-L18</b>	<b>Analysis</b>
	<i>Assignment III</i>			

Multirate Signal Processing	Decimation, Interpolation, DFT filterbanks, QMF filterbanks, multiresolution signal analysis, STFT, Wavelet transforms, filter bank for DWT <i>Assignment IV</i>	• Apply multirate SP techniques for communication applications	<b>L19-L27</b>	
Adaptive Filters	Adaptive filters, LMS algorithm, Recursive Least Squares (RLS) algorithm, Kalman filter	• To appreciate the principle of adaptive filter tuning	<b>L2i-L34</b>	<b>Application, Analysis</b>
Two dimensional signal processing	2-D signals and systems, Analysis of 2D systems in spatial, frequency and transform domains; Image enhancement <i>Assignment V</i>	• Analysis of 2 dimensional signals and systems	<b>L35 -L40</b>	<b>Application, Analysis</b>

9. Course web page : Moodle from iris

#### 10. Reference Books

1. J.G.Proakis and D.G.Manolakis, "Introduction to Digital Signal Processing", PHI, 2007	4. Sanjit K. Mitra, "Digital Signal Processing : A computer based Approach", 3 <sup>rd</sup> Edn, TMH, 2006
2. P.P. Vaidyanathan, "Multirate systems and Filter banks", Prentice Hall, 1993.	5. J. Orfanidis, "Optimum Signal Processing", McGraw Hill, 1989
3. S. Haykin, Adaptive Filter Theory, PH 1996	

#### 11. EVALUATION PLAN :

Mid semester exam - 25%      Assignments/Quiz - 35%  
End semester exam - 40%

Prepared by:

Sumam David S.  
Course Instructor

Approved by

Prof U. Shripathi Acharya  
Head, Dept of E&C and DPGC Chairperson