Mahindra École Centrale
ES209 - Signals and Systems
Semester: August-December 2018
Instructor: Dr K R Sarma
Tutors: Dr Naga, Dr Krishna Chaitanya, Dr Sayantan, Dr Subba Rao

DATE	DAY	LEC#	TOPIC
03AUG18	FRI	1	What is a signal? Mathematical representation Classes of signals –continuous, discrete complex, vector, multidimensional. even, odd, periodic, causal ; Gross parameters of signal- peak, average, rms, power, energy, Examples of signals exponents, sinusoids, singularity functions
08AUG18	WED	2	Orthonormal signal representation. CON series Choice of orthonormal basis functions, Generation of orthonormal set by Gram Schmitt procedure Power and energy of the signal. Significance in the context of linear operators on the signal
10AUG18	FRI	3	Periodic signals and expansion in orthogonal complex sinusoids, Fourier series Dirichlet conditions Properties of Fourier series Concept of "bandwidth"
14AUG18	TUE	EXTRA1	Aperiodic signals and Fourier Transform. Conditions on existence of FT. Properties of FT ,Bandwidth, time duration of signals, uncertainity principle, Large Time Bandwidth product signals, Pulse compression
15AUG18	WED		INDEPENDENCE DAY
17AUG18	FRI		PARSI NEW YEAR
22AUG18	WED	4	Discrete FT, Fast computation of FT-FFT. Cooley Tukey algorithm. Winograd algorithm Double FT and optics
24AUG18	FRI	5	Real part sufficiency and Hilbert transforms Statement of Paley Wiener condition. Complex signals Analytic signals and their spectrum
28AUG18	TUE	EXTRA 2	Measurement of spectrum- Heterodyning. Capon coherent memory filter, chirp transform and Darlington method
29AUG18	WED	6	Causal signals and Laplace transform. Regions of convergence in s-plane. Inverse Laplace Transform-partial fraction and Contour integration Properties of Laplace Transform
31AUG18	FRI	7	Discrete Signals, Sampling , sampling function and error in sampling, Z transform Inverse z transform Causal signals condition on their z transform Elementry discrete time signals
04SEPT18	TUE	EXTRA 3	
05SEPT18	WED		FIRST MINI TEST
07SEPT18	FRI		FIRST MINI TEST
12SEPT18	WED	8	What is a "system"? Classes of systems continuous and discrete
14SEPT18	FRI	9	Linear, Time invariant, Continuous systems: Impulse response and its relevance for LTI systems Convolution integral and its graphical explanation causality ,Eigen Functions and eigen values of systems and their significance
19SEPT18	WED	10	System transfer function, pole zero description, Bode plots stability Systems with feedback. Closed loop transfer function, Loop gain stability under feedback (RH, Root locus, Nyquist)
21SEPT18	FRI	11	Discrete time systems system impulse response and convolution periodic convolution Stability of discrete time systems FIR and IIR filters ARMA filters Random processes mean variance and
26SEPT18	WED	12	

			covariance Auto and cross correlation power spectral density white process Wiener Khinchin Theorem WSS process Orthonormal expansion Kahrunen Loeve expansion
28SEPT18	FRI	13	filters Random processes mean variance and covariance Auto and cross correlation power spectral density white process
03OCT18	WED	14	Wiener Khinchin Theorem WSS process Orthonormal expansion Kahrunen Loeve expansion
05OCT18	FRI	15	Mean and Output spectral density of WSS processes through LTI systems. System testing by cross correlation techniques
10OCT18	WED	16	Generation of random process with desired spectral density. Spectral decomposition
13OCT18	FRI	17	State space concept. State representation of continuous LTI systems Time domain solution and state transition matrix ZSS and ZIS Transfer function Computation of state transition matrix Cayley Hamilton method
16OCT18	TUE	EXTRA4	
17OCT18	WED		DURGASTAMI
19OCT18	FRI		SPECIAL HOLIDAY
23OCT18	TUE		SECOND MINI TEST
24OCT18	WED		SECOND MINI TEST
26OCT18	FRI	18	Controllability and observability, state estimation and control
31OCT18	WED	19	
02NOV18	FRI	20	State space representation of discrete systems
07NOV18	WED		DEEPAVALI
09NOV18	FRI		DEEPAVALI
13NOV18	TUE	EXTRA5	Estimation in the presence of noise. Wiener and Kalman filters
14NOV18	WED	21	
16NOV18	FRI	22	Linear Estimation in noise, optimum estimation, Yule-Walker Equation
21NOV18	WED	23	Epilogue. What is not covered in the course
23NOV18	FRI		KARTIKA PURNIMA
28NOV18	WED		START OF END SEMESTER EXAM

Books:

Samir Soliman, M D Srinath; Continuous and Discrete Signals and Systems; Prentice Hall.
P Ramakrishna Rao, Shankar Prakriya; Signals and Systems; McGraw Hill.
Michael Roberts, Govind Sharma; Fundamentals of Signals and Systems; Tata McGraw Hill.
McClellan, Schafer, Yoder; DSP First; Prentice Hall.
Oppenheim, Schafer; Discrete Time Signal Processing; Prentice Hall.
Papoulis; Signal Analysis; McGrw Hill.
Zeimer, Tanter; Signals and Systems Continuous and Discrete; Pearson.
Simon Haykin, Barry Van Veen; Signals and Systems; Wiley.
Oppenheim, Wilsky; Signals and Systems; Prentice Hall.
Rugh; Signals and Systems; John Hopkins University notes.
Baranuik; Signals and Systems; Rice University notes.
Oppenheim, George Verghese; Signals, Sytems and Intereference; MIT notes.
.... many more ....