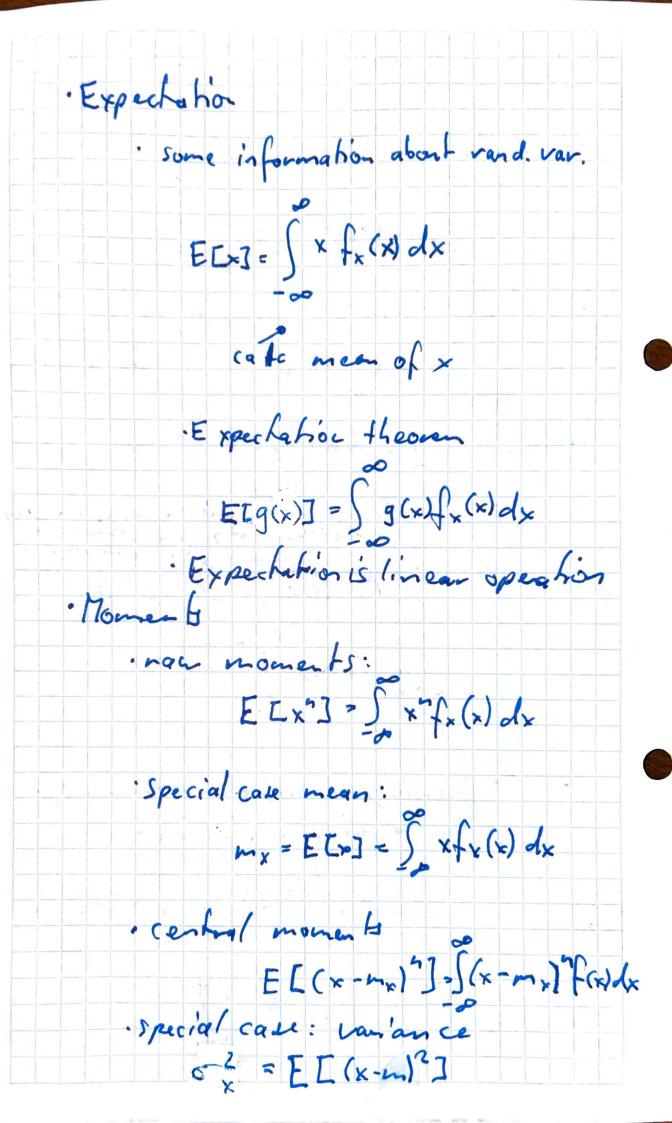
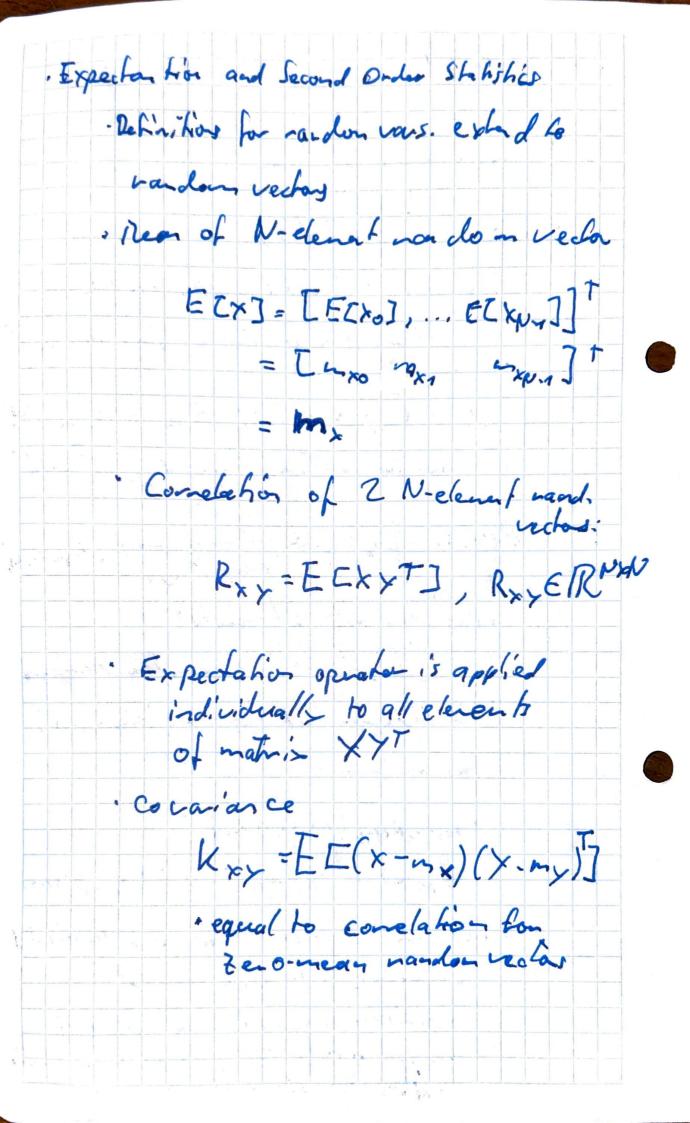
8. Stochastic Signal Processing
8.1. Random Variables
· Randon variable: mapping of q random event to a value XER
Measuring probability: Camalabre distribution Prophin Golf)
Comalative distantion Cunchia (colf) probability that x takes random values less ag. to Fx (a) = P[x \le \alpha], \alpha \in IR
$\lim_{\alpha \to \infty} F_{x}(\alpha) = 1$
Probability density function (pdf)
$f_{x}(\alpha) = \frac{d F_{x}(\alpha)}{d \alpha}, \alpha \in \mathbb{R}$
$F_{\times}(\alpha) = \int_{-\infty}^{\alpha} f(x) dx$



· Lelahio	s between mand	loen variables
	Cross-Correlation	
	Cxx = E	ed if ELXY]=
	Coraniance	EL×3 EL>3
		[(x·mx)(y-my)]
•	f Zero-mean	Cross-correlation but is certified around its magn
•		re unconslated
	anian ce:	Lariance is 320
		E[(x-mx)2].
. 51		
	6 = Vo	fion (square root of variance)

Example: Gaussian Randon Variable $f(x) = \frac{1}{\sqrt{2726^{27}}} e^{\frac{(x-m)^2}{26^2}}$ · paf: 6 = normal distribution · Variance = 62 normalization factor Jano21 ensures that for all randon variables the integral of the poll Over enhire real line is = 1

8.2. Random Vectors · Probability Distribution · Randon vector x: collection of Nuardon variables [xo ... xx. 35 6 Fx(d) = P[x; = a, 1=0, ..., 1.1] PDF: fr(a)= De Fx(do, - Kus) · Independent e leverts: a collection of N manlow variable is independent off the joint poll has ble for. fx01... (x01... (x01... x v-1) = fro (x0) ·fx1(x1) · · · · fxn (xm1) . Independent and identically distributed elemente (i.i. d. eknents) each nand var has some distribution fxi(xi) = f(xi), i=0,..., N-1



8.3. Random Processes · Probability Distribution · Random process (shoclashic proces): notation X [1]: n-th random variable (sample) of the requence . Pdf of randon process: joint distrib. of all samples in the sequence - statistical description of mandon process. joint polf for all k-tuples of time indices ix , k EN · i.i.d process (independent and identically dishibuted) pdf: [x Lio]x [in] ... x Lik-1] (xo, xo, xon) = TEf(xi)

· Second Order Description mean of process X [4], n E Z: E[X [n]] depeds on n · correlation (auto correlation) R, [1,4] = E[XC1] XC43], 1, KEZ · Covariance Cantocovariance Kx [1, k] = E[(XLI]-mxEG). (X[4]-mx[4]) = Rx [1, k] - mxxxx mxxx 1,4 € Z · Cross-correlation of two procoses Rxx [1, k] = E[XL1] YL6]] . mean and variance of random processes: se con d'order description to phy sicall > meaning hal: pour of mander proces