a e Coordinator	VÄLKOMMEN TILL SVERIGES STÖRSTA TEKNISKA UNIVERSITET. DATA BETRIF										e			
Involved Institutions	TENNILLINEN KORREAKOLLU TENNISKA INGOSKOLAN HELSINU UNIVERSITI OF TECHNOLOGY													
Name of										Туре				
the course	MIMO Communication Systems and Antennas							M		D	A/D	А		
Place	KTH- Stockholm										ontomb	or		
1 1000									2005					
Summary (2000 words)	This course deals with MiNIC communication systems in terms of signal processing and resource allocation and antennas for such systems, in particular small antennas for MIMO terminals. The course will feature lectures as well as computer exercises and real-world hands-on laboratories. The course consists of three parts, computer based antenna-design and evaluation, signal processing laboratory on a real MIMO testbed, and talks on signal-processing and resource allocation in multi-user MIMO systems. The antenna-design part of the course will provide a brief overview of design principles for small antennas for mobile communications systems. This includes the theoretical background, design principles, implementation aspects, and measurement methods for wideband multi-element (especially MIMO) terminal antennas. In the laboratory work, participants will gain hands-on experience using the HUT measurement-based antenna testbed MEBAT. The MEBAT testbed allows characterizing the performance of a multi-element terminal antenna in real propagation environments that were previously measured at HUT. The students will design antennas with modern SW tools and assess their efficiency, MEG, and realistic MIMO performance with computational methods. The signal processing laboratory will be done on the real-time multi-user MIMO test-bed (MUMS) of KTH. The test-bed is unique that it has two transmitting nodes (base-stations) equipped with two antennas each and two receiving nodes (mobiles) equipped with two antennas each as well as feedback from both receiving nodes to both transmitting nodes (such that the transmitting nodes may have knowledge of the channel of both the desired and co-channel receiving node). The participants will be given insight into the operation of the test-bed. They will also do laboratoratorise on the test-bed where they will change lines of code in a beamforming application and interpret the result.													
	a lap-top PC with Windows operating system.													
Structure of the	Lectures	Experimenta labs.	I Com	rcise		al	Credits	A	ssess	ment ty	pology			
course	18	8	14	14 40		One week full-time.		E: sa	Exercises carried out in a satisfactory way.					
Teachers	Name		Organization			Title								
	Per Zetterberg Biörn Ottersten						КТН			Researcher				
							KTH			Professor				
	Mats Bengtsson Pertti Vainikainen					KTH			PhD, Research Assoc					
						HUT			Professor.					
	Clemens Icheln						НИТ			PhD				
	Juha Villanen		HUT			M Sc								
			1101											
Availability	College rooms Dedicated Labs					Clas	Computer room		r rooms	s Canteen				
of dedicated structures	Yes	Not	yes	not		yes	not	ye	S	Not	Yes	not		