

COURSE TITLE	TE142454: Multi-Antenna Communication Systems Credits: 2 ELECTIVE COURSE
LEARNING OBJECTIVES	To study modern digital communication techniques for high speed and reliable data transmission by using multiple antennas, as well as its characterisation, capacity and performance from theoretical point of view.
COMPETENCY	The students will understand: <ul style="list-style-type: none"> • Structure and characterisation of multi antenna communication systems • Array signal processing techniques • Space-time coding techniques for high bit rate and reliable transmission, and its performance
SUBJECTS	<ul style="list-style-type: none"> • Review: EM wave propagation by antenna • Antenna parameters • Array antenna with two isotropical elements • Pattern synthesis with array factor • Linear array antenna with N isotropical elements • Array antenna with amplitude distribution • Rectangular array antenna • Steering vector • LCMV algorithm • Intelligent antenna • Signal direction of arrival (DOA) detection • MUSIC algorithm; ESPRIT algorithm; SAGE algorithm • Communication system capacity with multiple antenna • MIMO communication system model • MIMO communication system capacity • Keyhole channel • Average capacity and outage • Spatial multiplexing • BLAST structure; BLAST in frequency selective channel • Transmit diversity and space-time coding • STBC Alamouti; Higher order orthogonal STBC; STTC • Distributed MIMO antenna • Introduction to cooperative communication system
MAIN REFERENCES	<ul style="list-style-type: none"> • Ezio Biglieri, Robert Claderbank, Anthony Constatinides, Andrea Goldsmith, Arogyaswami Paulraj, H. Vincent Poor, <u>MIMO Wireless Communications</u>, Cambridge University Press, 2007.
OPTIONAL REFERENCES	<ul style="list-style-type: none"> • Alex Gershman, <u>Space-Time Processing for MIMO Communication</u>, Wiley, 2005. • IEEE Transaction on Communications • IEEE Transaction on Wireless Communication • IEEE Transaction on Signal Processing • IEEE Transaction on Information Theory • IEEE Journal on Selected Areas of Communications
PREREQUISITE	-