



# Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India  
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
ETE804	Ultra Wide Band Communication	4	--	--	4	--	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		10		30		100 (60% Weightage)		

<b>Pre-requisite Course Codes</b>	ETC 504: RF Modeling and Antennas.
After successful completion of the course, student will be able to	
<b>Course Outcomes</b>	CO1 Understand nuances of planning and design of RF network
	CO2 Work professionally in the area of Antenna design and Radio Propagation
	CO3 Apply the knowledge of mathematics and engineering to solve practical EM engineering problems

Module No.	Unit No.	Topics	Ref.	Hrs.
1	<b>Introduction</b>			10
	1.1	UWB BASICS.		
	1.2	Regulatory bodies		
	1.3	UWB signals and systems with UWB waveforms		
	1.4	Power spectral density, Pulse shape, Pulse trains, Spectral masks		
	1.5	Multipath, penetration characteristics, spatial and spectral capacities – speed of data transmission		
	1.6	Gaussian waveforms, Designing waveforms for specific spectral masks.		
	1.7	Practical constraints and effects of imperfections.		
2	<b>Signal Processing Techniques For UWB Systems And UWB Channel Modeling</b>			10
	2.1	Effects of lossy medium on UWB transmitted signal		
	2.2	Time domain analysis, frequency domain analysis		
	2.3	Detection and Amplification,		
	2.4	Two ray UWB propagation model,		
	2.5	Frequency domain auto regressive model, IEEE proposals for UWB channel models		
3	<b>UWB Communications</b>			05
	3.1	UWB modulation methods, pulse trains		
	3.2	UWB transmitter/receiver		
	3.3	Multiple access techniques in UWB, capacity of UWB systems		
4	<b>Advanced UWB Pulse Generation</b>			05
	4.1	Comparison of UWB with other wideband communication systems		
	4.2	Interference and coexistence of UWB with other systems		



# Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India  
(Autonomous Institute Affiliated to University of Mumbai)

	<b>4.3</b>	Hermite pulses: orthogonal prolate spheroidal wave functions		
	<b>4.4</b>	Wavelet packets in UWB PSM		
	<b>4.5</b>	Applications of UWB communication systems		
<b>5</b>	<b>UWB Antennas and Arrays, Position and Location with UWB Signals</b>			<b>10</b>
	<b>5.1</b>	Antenna fundamentals: Antenna radiation for UWB signals		
	<b>5.2</b>	Conventional antennas and Impulse antennas for UWB systems		
	<b>5.3</b>	Beam forming for UWB signals: radar UWB array systems		
	<b>5.4</b>	Wireless positioning and location: GPS techniques, Positioning techniques time resolution issues, UWB positioning and communications.		
<b>6</b>	<b>UWB Communication Standards and Systems</b>			<b>12</b>
	<b>6.1</b>	UWB standardization in wireless personal area networks		
	<b>6.2</b>	DS-UWB proposal, MB-OFDM UWB proposal: IEEE proposals for UWB channel models		
	<b>6.3</b>	UWB ad-hoc and sensor networks		
	<b>6.4</b>	MIMO and Space-time coding for UWB systems		
	<b>6.5</b>	Self-interference in high data-rate UWB communications, coexistence of DS-UWB with WIMAX		
			<b>Total</b>	<b>52</b>

## References:

1. M. Ghavami, L. B. Michael and R. Kohno, —*Ultra Wideband Signals and Systems In Communication Engineering*|| , 2nd Edition, John Wiley & Sons, NY, USA, 2007.
2. Jeffrey H. Reed, —*An Introduction To Ultra Wideband Communication Systems*|| , Prentice Hall Inc., NJ, USA, 2005.
3. Ian Oppermann, Matti Hamalainen and Jari Iinatti —*UWB Theory and Applications*|| , John Wiley & Sons Ltd, 2004