Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ETE804	Ultra Wide Band Communication	04	--	--	04		--	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Ave. Of Test 1 and Test 2					
ETE804	Ultra Wide Band Communication	20	20	20	80	-	-	-	100

Prerequisite: ETC 504: RF Modeling and Antennas.

Course Objective:

- To focuses on the basic techniques that concerns present and future dynamic UWB communication systems.
- To encompass all areas of design and implementation of UWB systems.
- To develop a comprehensive overview of UWB system design that spans propagation, transmit and receive antenna implementations, standards and advanced topics, modulation and multiple access, network issues, and applications.

Course Outcomes: Students will be able to;

- Understand nuances of planning and design of RF network
- Work professionally in the area of Antenna design and Radio Propagation.
- Apply the knowledge of mathematics and engineering to solve practical EM engineering problems.

Module No.		Topics	Hrs.
1.		**Introduction**	**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		**Signal Processing Techniques For UWB Systems And UWB Channel Modeling**	**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		**UWB Communications**	**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		**Advanced UWB Pulse Generation**	**05**
	4.1	Comparison of UWB with other wideband communication systems	
	4.2	Interference and coexistence of UWB with other systems	
	4.3	Hermite pulses: orthogonal prolate spheroidal wave functions	
	4.4	Wavelet packets in UWB PSM	
	4.5	Applications of UWB communication systems	
5		**UWB Antennas and Arrays, Position and Location with UWB Signals**	**10**
	5.1	Antenna fundamentals: Antenna radiation for UWB signals	
	5.2	Conventional antennas and Impulse antennas for UWB systems	
	5.3	Beam forming for UWB signals: radar UWB array systems	
	5.4	Wireless positioning and location: GPS techniques, Positioning techniques time resolution issues, UWB positioning and communications	
6		**UWB Communication Standards and Systems**	**12**
	6.1	UWB standardization in wireless personal area networks	
	6.2	DS-UWB proposal, MB-OFDM UWB proposal: IEEE proposals for UWB channel models	
	6.3	UWB ad-hoc and sensor networks	
	6.4	MIMO and Space-time coding for UWB systems	
	6.5	Self-interference in high data-rate UWB communications, coexistence of DS-UWB with WIMAX	
Total			**52**

Recommended Books:

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

Internal Assessment (IA):
Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the test will be considered as final IA marks

End Semester Examination:
1. Question paper will comprise of 6 questions, each of 20 marks.
2. Total 4 questions need to be solved.
3. Question No.1 will be compulsory and based on entire syllabus wherein sub questions of 2 to 5 marks will be asked.
4. Remaining question will be selected from all the modules.