RK.UNIVERSITY

SYLLABUS

Course Title	Software Defined Radio	
Course Code	ET205	
Course Credit	Theory	: 04
	Practical	: 01
	Tutorial	: 00
	Total	: 05

Course Objective

This course describes the fundamental radio components and how these components are implemented in software. The principles of software architecture to support the SDR will be developed. Policy and cooperation mechanisms that enable SDR to interoperate will be developed. In this course you will study and build SDR and investigate their role in future communication systems.

Detailed Syllabus

Sr. No.	Name of chapter & details	Hours Allotted
	Section – I	
1	**Introduction to SDR** What is a Software Radio? The need for Software Radios, Characteristics and benefits of a Software Radio, Design principles of Software Radio	**04**
2	**Radio frequency implementation issues** The purpose of the RF Front-End, Dynamic range: The principal challenge of receiver design. RF receiver front-end topologies, Enhanced flexibility of the RF Chain with Software Radios, Importance of the components to overall performance, Transmitter architectures and their Issues, noise and distortion in the RF Chain, ADC and DAC distortion	**16**
3	**Digital hardware choices** Key hardware elements, DSP processors, Field Programmable Gate Arrays, Trade-offs in using DSPs, FPGAs, and ASICs, Power management issues, Combination of DSPs, FPGAs, and ASICs	**04**
	Section – II	
4	**Digital generation of signals** Comparison of direct digital synthesis with analog signal synthesis, Approaches to direct digital synthesis, Analysis of spurious signals, Spurious components due to periodic jitter, Band pass signal generation, Performance of direct digital synthesis systems, Hybrid DDS-PLL Systems, Applications of direct digital synthesis, Generation of random sequences, ROM compression	**07**

	technique	
5	**Analog to digital and digital to analog conversion** Parameters of ideal data converters, Parameters of practical data converters, Techniques to improve data converter performance, Common ADC and DAC architectures	**04**
6	**Smart antennas designing issues** Vector channel modeling, Benefits of smart antennas, Structures for beam forming systems, Smart antenna algorithms, Diversity and space-time adaptive signal processing, Algorithms for transmit STAP, Hardware implementation of smart antennas, Array calibration	**13**

Instructional Method and Pedagogy:

- Lectures will be conducted with the aid of multi-media projector, blackboard, OHP etc. Assignments based on course contents will be given to the students at the end of each unit/topic and will be evaluated at regular interval
- Minimum five experiments shall be there in the laboratory related to course contents
- Minimum six tutorials which includes solution of minimum five computer programs in each head

Students Learning Outcomes:

Students who successfully complete this course will have

1. An ability to make system-level decisions for software-defined radio technology and products
2. Knowledge of software development methods for embedded wireless systems
3. An ability to implement smart antenna algorithms
4. Knowledge of digital hardware architectures and understanding of development methods
5. An understanding of middleware in SDR
6. Understanding of analog RF components

Text books:

1. J.H. Reed, Software-Defined Radio, Prentice-Hall, 2002

Reference Books:

1. Software Radio Architecture: Object-Oriented Approaches to Wireless Systems Engineering by Joseph Mitola Wiley-Interscience; 1st edition 2000
2. Antenna Theory: analysis and design, 2nd ed., Balanis, Wiley, 1997