ECMC2T5B : SOFTWARE RADIO

UNIT 1: Software Radio Concepts and Radio Frequency Implementation Issues:

Need for software radio, what is a software radio, characteristics and benefits of software radio, design principles of software radio, purpose of the RF Front-End, Challenges of receiver design**:** Dynamic range, RF Receiver front-end topologies, enhanced flexibility of the RF chain with software radios, importance of the components to overall performance, transmitter architecture and their issues, noise and distortion in the RF chain, ADC and DAC distortion, Predistortion, flexible RF systems using microelectromechanical systems.

UNIT 2: Multirate Signal Processing'

Introduction, sample rate conversion principles, polyphase filters, digital filter banks, timing recovery in digital receivers using multi-rate digital filters.

UNIT 3: Generation of Digital Signals

Introduction, 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.

UNIT 4: Analog to Digital and Digital to Analog Conversion

Introduction, parameters of ideal data converters, parameters of practical data converters, techniques to improve data converter performance, common ADC and DAC Architectures.

UNIT 5: Smart Antennas

Introduction, vector channel modeling, benefits of smart antennas, structure for Beamforming systems, smart antenna algorithms, diversity and space-time adaptive signal processing. Algorithms for transmit STAP, hardware implementation of smart antennas.

UNIT 6 : Digital Hardware Choices

Introduction, hardware elements, DSP processors: DSP core, DSP Architecture, Numeric representation, Addressing, pipelining, peripherals and additional features, Multi-prosessing, multi-processing using a real time operating system, software design cycle, maximizing performance, benchmarks and performance evaluation.

UNIT 7 : Object-Oriented Representation of Radios And Network Resources

Introduction, networks, object-oriented programming, object brokers, mobile application environments, joint tactical radio system.

UNIT 8 : Software Radio Design Case Studies

Introduction and Historical perspective, SPEAKeasy, Joint Tactical Radio System (JTRS), wire information transfer system, SDR-3000 Digital transceiver subsystem, spectrum ware

Text Books:

1. JEFFREY H.REED , “Software Radio : A Modern Approach to radio engineering” Reprint by pearson Education & inc 2002.

Reference Books:

1. Joseph Mitola, III, software Radio Architecture: Object Oriented Approches to Wireless Systems Engineering.John Wiley and Sons, 2000.
2. B.Razavi, RF Microelectronics, prentice Hall,1998.
3. S.K. Mitra, Digital Signal Processing : A computer based approach.McGraw-Hill,1998.