VL5002 RF IC DESIGN

DETAILED SYLLABUS

OBJECTIVES:

- To study the various impedance matching techniques used in RF circuit design.
- To understand the functional design aspects of LNAs, Mixers, PLLs and VCO.
- To understand frequency synthesis.

UNIT I IMPEDANCE MATCHING IN AMPLIFIERS

Definition of „Q", series parallel transformations of lossy circuits, impedance matching using „L", „PI" and T networks, Integrated inductors, resistors, Capacitors, tunable inductors, transformers

UNIT II AMPLIFIER DESIGN

Noise characteristics of MOS devices, Design of CG LNA and inductor degenerated LNAs. Principles of RF Power Amplifiers design,

UNIT III ACTIVE AND PASSIVE MIXERS

Qualitative Description of the Gilbert Mixer - Conversion Gain, and distortion and noise, analysis of Gilbert Mixer – Switching Mixer - Distortion in Unbalanced Switching Mixer - Conversion Gain in Unbalanced Switching Mixer - Noise in Unbalanced Switching Mixer - A Practical Unbalanced Switching Mixer. Sampling Mixer - Conversion Gain in Single Ended Sampling Mixer - Distortion in Single Ended Sampling Mixer - Intrinsic Noise in Single Ended Sampling Mixer - Extrinsic Noise in Single Ended Sampling Mixer.

UNIT IV OSCILLATORS

LC Oscillators, Voltage Controlled Oscillators, Ring oscillators, Delay Cells, tuning range in ring oscillators, Tuning in LC oscillators, Tuning sensitivity, Phase Noise in oscillators, sources of phase noise

UNIT V PLL AND FREQUENCY SYNTHESIZERS

Phase Detector/Charge Pump, Analog Phase Detectors, Digital Phase Detectors, Frequency Dividers, Loop Filter Design, Phase Locked Loops, Phase noise in PLL, Loop Bandwidth, Basic Integer-N frequency synthesizer, Basic Fractional-N frequency synthesizer

REFERENCES:

1. B.Razavi ,"RF Microelectronics" , Prentice-Hall ,1998

2. Bosco H Leung "VLSI for Wireless Communication", Pearson Education, 2002

3. Behzad Razavi, "Design of Analog CMOS Integrated Circuits" McGraw-Hill, 1999

4. Jia-sheng Hong, "Microstrip filters for RF/Microwave applications", Wiley, 2001

5. Thomas H.Lee, "The Design of CMOS Radio –Frequency Integrated Circuits", Cambridge University Press ,2003