B.E. Sem.VII [ETRX]

Basics of VLSI

SYLLABUS

Time : 3 Hrs.

Theory : 100 Marks
Term Work : 25 Marks
Oral : 25 Marks

1. **Physics of FET**
   NMOS, PMOS, enhancement and depletion mode transistor, MOSFET, threshold voltage, flatband condition, threshold adjustment, linear and saturated operation, FET capacitance, mobility saturation, thermal variation, short channel and hot electron effect.

2. **Silicon Semiconductor Technology**
   Wafer processing, mask generation, oxidation, epitaxy ion implantation, diffusion, metalization, basic NMOS and PMOS processes. Process simulation using CAD tools.

3. **Scaling**
   Scaling of MOS circuits, type of scaling, functional limitations of scaling, scaling of wires and interconnects.

4. **Design Rules and Layout**
   Purpose of design rules, NMOS and CMOS design rules and layout, Design of NMOS and CMOS inverters, NAND and NOR gates. Interlayer contacts, butting and buried contacts, stick diagrams, layout of integrated circuits, use of layout tools like MAGIC for integrated circuits.

5. **MOS Inverters**
   MOSFET aspect and inverter ratio, Enhancement VS Depletion mode pull ups, standard CMOS inverter, transit time and switching speed of NMOS and CMOS inverters, NMOS and CMOS gates, transistor sizing and power dissipation, noise margin calculations, SPICE models and circuit simulation using PSPICE.

6. **Design of Basic VLSI Circuits**
   Design of circuits like multiplexer, decoder, priority encoder, Flip flops, shift registers using MOS circuits.

7. **Design Methodologies**
   Design analysis and simulation, design verification, design implementation, design synthesis, validation and testing of manufactured circuits.

❑ ❑ ❑ ❑ ❑ ❑

B.E. Sem.VII – [ETRX]

Digital Communication

SYLLABUS

Time : 3 Hrs.

Theory : 100 Marks
Term Work : 25 Marks
Oral : 25 Marks

1. **Random variables :** Review of probability theory, communications examples , Random variables, probability Distribution function, probability density function, joint cumulative distribution and probability density, average value and variance of a random variable, The error function, The Gaussian probability density The Rayleigh probability density, The central limit theorem.

2. **Information Theory :** Discrete messages, the concept of amount of Information, Entropy, Information rate, coding to increase Average Information per bit – Huffman coding, Lempel Ziv coding Shannon's Theorem, Channel capacity, capacity of a Gaussian channel, Bandwidth – S/N trade – off.

3. **Error control coding :** Rationale for coding and types of codes, Discrete memoryless channel , some Algebraic concepts – code efficiency and Hamming bound , linear block codes, Cyclic codes, Convolutional codes , maximum likelihood decoding of convolutional codes.

4. **Baseband shaping for data transmission :** Discrete PAM signals, Power spectra of discrete PAM signals, Intersymbol Interference, Nyquist's criteria for distortionless baseband, Binary transmission, correlative coding eyepattern , Baseband M - ary PAM systems.

5. **Baseband Detection :** Correlation receiver, Matched filter receiver, Detection of signals with unknown phase in noise, Equalization concepts [no algorithms expected], Tapped – Delay Lines equalization, liner predictive vocoders.

6. **Digital Modulation techniques :** Digital Modulation formats, coherent binary modulation techniques, coherent quadrature modulation techniques, Noncoherent binary modulation techniques ,Comparison of binary and quaternary modulation techniques, M – ary modulation, Power spectra, Bandwidth efficiency, Applications of digital modulation techniques.

7. **Spread spectrum modulation :** Pseudo – noise sequences, Baseband spread spectrum system, DS – BPSK, processing gain, Probability of error, Jamming Margin, Frequency – Hop spread spectrum, Applications.

❑ ❑ ❑ ❑ ❑ ❑

B.E. Sem.VII – [ETRX]

Filter Theory and Applications

SYLLABUS

Time : 3 Hrs. **Theory :** 100 Marks

Term Work : 25 Marks

Filter Analysis in Frequency domain

- Review of Frequency response of IIR filter
- Linear Phase FIR Systems
  - Condition for Linear Phase
  - Magnitude& phase response for Four types of Linear Phase systems
  - Location of zeros

Analog filter designing techniques

- The design process
- The Butterworth filter
- The Chebyshev approximation
- The elliptic approximation
- The Bessel function

IIR Digital filter Design

- Methodology, Analog & Digital domain mapping, Spectral transformations
- Impulse – Invariance Method
- Bilinear transform technique
- Matched Z-Transform technique
- Intuitive approaches

FIR Digital filter Design

- FIR versus IIR filters
- Window-based Design of different types of filters
  - Gibb's Phenomenon
  - Design using different Windows
  - Use of Kaiser Window
- Half-Band FIR filters
- Frequency sampling technique
- Design of optimal linear phase FIR filters
- Structures for implementation of filters

Quantization Effects

- Quantization methods
- Limit cycle oscillations due to Quantization
- Errors in frequency response due to coefficient Quantization

❑ ❑ ❑ ❑ ❑ ❑

B.E. Sem.VII – [ETRX]

Instrumentation Systems

SYLLABUS

Time : 3 Hrs. **Theory :** 100 Marks

Term Work : 25 Marks

1. **Fundamental Concept Of Measurement & Performance characteristics of An Instrumentation System :** System Configuration–Block diagram of a generalized measurement system, Generalized measurements–Transfer function representation & sinusoidal Transfer function, Zero order system, First order system–Response of a system to Step, Ramp, Impulse input & Frequency response. Second Order system–Response of the system to Step, Ramp input & Frequency response of. Second order system. Dead time element, Dynamic response of measurement systems.

2. **Transducers :** Classification and Requirements. Displacement – principle of transducers, potentiometric displacement transducer, L.V.D.T., Variable capacitance transducer, Hall effect–angular displacement transducer, Digital transducer. Strain – Types of Strain gauge, theory of operation of resistance strain gauge, types of electrical strain gauge, Materials for strain gauge, Gauging techniques, Strain gauge circuits, Temperature compensation, Application. Vibration – Vibration sensing Devices – Velocity transducer, Bonded Strain Gauge Accelerometer, Piezoelectric Accelerometer, servo Accelerometer, Digital Accelerometer. Signal conditioners for vibration transducer output. –voltage amplifier, Charge amplifier. Application. Temperature – Classification of temperature sensors, Resistance type temperature sensor, Platinum resistance thermometer. Thermister. Thermocouples – Properties, Material used for construction, Reference junction compensation, Thermocouple output linearizing circuits. Temperature measurement by radiation method – Optical pyrometer. Solid state transducer. Pressure – Diphragrams, capsule, Bourdon tube, Bellows, Variable reluctance type, Variable capacitance type, Thin film pressure transducer, Digital pressure transducer, Piezo electric transducer. Force And Torque – Different types of load cell configuration, Effect of temp. Variation, Dynamic response of elastic transducer, Digital force transducer. Torque Measurement – Absorption type, Transmission type, Stress type, and Deflection type. Flow – Classification of flow meter, Head type flow meter, Electromagnetic type, Rotameter, Anemometer, Ultrasonic flow meter. Photo Electric Transducer – The photo multiplier tube, Photo conducive cell, Photo – Voltaic cell, Semiconductor photo diode, Photo transducer.

3. **Data Acquisition :** Generalized data acquisition system, Multi–channel DAS, Data logger, PC based data acquisition System, Concept of Virtual Instrumentation.

❑ ❑ ❑ ❑ ❑ ❑

B.E. Sem.VII [ETRX]

Wireless Communication

SYLLABUS

Time : 3 Hrs.

Theory : 100 Marks
Term Work : 25 Marks
Oral : 25 Marks

1. **Introduction :**
   Introduction to wireless communication systems.

2. **The Cellular Concept**
   Frequency reuse, Hand-off strategies, Interference and system capacity, Tracking and grade of service, Improving coverage and capacity in cellular system.

3. **Mobile Radio Propagation :**
   Large scale path Loss : Reflection, Ground reflection (2 ray model), Diffraction, Scattering, Practical Link Budge – Design using path loss models.
   Small scale fading and multipath : Small scale multipath propagation, parameters of Mobile Multipath Channels, Types of small scale fading, Rayleigh and Riceaw Distributions.
   Diversity Techniques.

4. **Wireless systems and standards :**
   Analog Cellular Systems : AMPS and ETACS – System Overview, Cell Handling, Air Interface, N-AMPS.
   Digital Cellular System : GSM – Services and Features, system architecture, Radio subsystem channel types, frame structure, signal processing, typical call flow sequences in GSM. CDMA Digital cellular standard – Frequency and channel specifications, forward CDMA channel, Reverse standard channel.
   Cordless Telephones :CT 2, Standard, DECT, PACS (Personal Access Communication System), PHS (Personal Handy Phone System).

5. **Mobile Data Communications :**
   Specialized packet and mobile Radio Networks, circuit switched Data services on Cellular Networks, Packet switched Data services on Cellular Networks, Data over low power Wireless and Cordless Networks.