Course 3-b: Advanced Topics in E and TC/ Electronics Engineering

Note: Each Unit is of 2 credits. A candidate has to take any THREE units (06 credits)

Unit 1
Microelectronics and VLSI

Microelectronic devices, characteristics, mathematical modeling, performance parameters, design aspects, parasitics, integration issues, layout rules, optimization techniques.

Unit 2
RFIC Design

RF Amplifiers, characteristics, mathematical models, power relations, stability considerations, stability circles, unconditional stability, stabilization methods, designs, circles, circles.

Unit 3
Mixed Signal Analysis

Signal integrity, techniques, equivalent models, characteristics, limitations, mixed signal processing, simulation, physical parameters.

Unit 4
RF Systems

The techniques of RF amplifier, mixer and local oscillator designs, Advanced YIG and narrow band filters, amplifiers, Transmission line design, Design challenges in satellite frequency bands.

Unit 5
Microwave and Antennae

Microwave sources, Passive devices, MMIC, MMIC fabrication techniques, Thick and Thin film technologies and materials, Microstrips, Microwave antennae.
Unit 6
Coding and Modulation Techniques in Communication

Digital communication system architectures, Source coding, Channel coding, Performance measures of communication systems, PLD based system implementations and related issues.

Unit 7
Communication Network

Various IEEE standards, Performance issues, Trade-offs, Network architectures, Security algorithms with their performance measures.

Unit 8
Wireless & Broadband Communication

IEEE/ITU/ETSI communication standards and specifications, various trade-offs in functionality, implementation, Transmitter/Receiver architectures and related issues, Wireless embedded approach, Antennae and front end design issues.

Unit 9
Advanced Topics in Signal Processing

Modeling different Signals and systems, various transforms, System design and Implementation issues, DSP architectures and related issues, Evaluation parameters for the various applications.

Unit 10
Image Processing & Pattern Recognition

Image representation formats, noise, processing techniques, Performance measures, various algorithms, Pattern classifications and recognition techniques, Biometrics.

Unit 11
Speech Processing

Speech recognition and synthesis techniques, modeling the speech signal, various algorithms, trade-offs and implementation issues.
Unit 12
Processor Architectures

Design philosophy of RISC, CISC, Multi-core, Various processor architectures, Design of microcontroller CPU.

Unit 13
Programmable Architectures and Memories

HDL programming, PLDs, floating point arithmetic, multipliers, modeling a sequential machine, Barrel shifter, HDL models for memories and buses.

Unit 14
System on Chip and MEMs

Chip architecture, Clock & power related issues, SRC, DRC, I/O architectures, Wire parasitic, Design validation, MEMs.

Unit 15
Modern Control Theory

Control mechanisms and their modeling, Implementation aspects and related trade-offs, various applications, Selection criteria’s of control systems for various applications, Performance evaluation techniques.

Unit 15
Human Machine Interface

Different techniques used for HMI, Algorithms, Related issues and constraints, Performance issues, Applications.
Unit 16
Machine Vision

Human vision, Expert systems, Algorithms, Implementation issues and trade offs, Performance measures and analysis.

Unit 17
Biomedical Engineering

Biomedical Signals, Biomedical Systems, Analysis, Implementation issues, Performance measures.

Unit 18
Nano Technology

Present devices and materials, Advance materials such as Carbon nano tubes etc., advance devices, constraints, applications, Trade offs.

References:


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