

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:

1. M.J. Roberts, "Signals and Systems", Tata McGraw Hill Publications, 2003.
2. M. Burns, "Introduction to Mixed Signal IC Test and Measurement", Oxford University Press Publications, New York.
3. Xilinx, "The Programmable Logic Data Book", Xilinx, California.
4. Hu, Yu Hen, "Handbook of Neural Network Signal Processing", CRC Press Publications.
5. Yacoub M.D., "Wireless Technology", CRC Press Publications.
6. Gold B., "Speech and Audio Signal Processing", John Wiley Publications.
7. Kuo B.C., "Digital Control System", Sounders College Publications, New York.
8. Comer "Digital Logic and State Machine Design", Sounders College Publications, New York.
9. Prokis J.G., "Digital Signal Processing", PHI Publications.
10. Alley, Charles L, "Micro Electronics", McGraw Hill Publications.
11. Ha, Tri T., "Digital Satellite Communication", McGraw Hill Publications.
12. Peebles, "Probability and Random Signals", McGraw Hill Publications.
13. Balanis, "Antenna Theory analysis and Design", John Wiley Publications.
14. Gray R.P., "Analysis and Design of Analog ICs", John Wiley Publications.
15. Tompkins J.W., "Biomedical Digital Signal Processors", PHI Publications.
16. Collin E.R., "Foundations for Microwave Engineering", McGraw Hill Publications.

17. Freeman R.L., "Radio System Design for Telecommunication", John Wiley Publications.
18. Kronsjo L., "Advances in Parallel Algorithm", Blackwell Scientific Publication, London.
19. Xavier, Eugune S.P., "Statistical Theory of Communication", New Age International Publication.
20. Baker R.J., "CMOS: Circuit Design, Layout and Simulation", IEEE Press Publication.
21. McGillen C.D., "Continuous and Discrete Signal and System Analysis", Oxford University Press.
22. Russ J.C., "The Image Processing Handbook", CRC Press Publications.
23. Franssila S., "Introduction to Micro fabrication", John Wiley Publications.
24. Park J., "Practical Embedded Controllers", Elsevier Publications, Amsterdam.
25. Kabatiansky G., "Error Correcting Coding and Security for Data Network", John Wiley Publications.
26. Lee K., "Semiconductor Device Modeling For VLSI", PHI Publications.
27. Maxfield C.M., "The Design Warriors Guide to FPGA", Elsevier Publications, Amsterdam.
28. Carsten Steger, Markus Ulrich, Christian Wiedemann, "Machine Vision Algorithms and Applications", Wiley-VCH, Weinheim Publications.
29. Pires, J. Norberto, "Human Machine Interface for Industrial Robotic Cells", Springer Publications.
30. Peter J. F. Harris, "Carbon Nanotubes and Related Structures New Materials for the Twenty-first Century", Cambridge Publications.
