

NIRMA UNIVERSITY
SCHOOL OF TECHNOLOGY, INSTITUTE OF TECHNOLOGY
B.Tech. Electronics & Communication Engineering
Semester - VI
Department Elective II

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Course Code	2ECDE05
Course Title	Electronic System Design

Course Outcomes (COs):

At the end of the course, the students will be able to

1. Identify the design issues in analog and mixed-signal circuit design.
2. Analyze the performance parameters of the Analog-Digital Converter (ADC-DAC).
3. Rectify the design issues in the digital circuit layout.
4. Analyze system design issues due to Electro-Magnetic Interference (EMI) and Electro Static Discharge (ESD).

Syllabus:

Teaching Hours:45

UNIT 1: Analog and Mixed-Signal Circuit Design Issues and Techniques **02**

Passive components, Understanding and interpreting data sheets and specifications of various passive and active components, non-ideal behavior of passive components.

UNIT II: Design Issues of Opamps

DC performance of op amps: Bias, offset and drift, AC Performance of operational amplifiers, bandwidth, slew rate and noise, Properties of a high-quality instrumentation amplifier, Design issues affecting dc accuracy & error budget analysis in instrumentation amplifier applications, Isolation amplifier basics and Active filters, design of low pass, high pass and bandpass filters.

07

UNIT III: Data Conversion Systems

Types of ADCs and DACs, Characteristics and performance parameters of ADC & DAC, interfacing to microcontrollers, selecting proper ADC and DAC.

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UNIT IV: Design Issues of Logic Circuit

Understanding and interpreting datasheets, specifications of various CMOS & BiCMOS family Logic devices, Electrical behavior (steady-state & dynamic) of CMOS & BiCMOS family logic devices, CMOS/TTL Interfacing, JTAG/IEEE 1149.1 design considerations, Design for testability, estimating digital system reliability.

05

UNIT V: Design on Printed Circuit Boards

Introduction to the technology of printed circuit boards (PCB), General layout and rules and parameters, PCB design rules for Digital, High Frequency and Analog circuits.

03

UNIT VI: System Integration Issues

Introduction to Electromagnetic Interference, Causes, Electromagnetic Compatibility and standards, Cabling of Electronic Systems, Grounding of Electronic Systems, Filtering, Protection of hardware and software against Electrostatic Discharges (ESD), Automation Standards, industry standards for electronic system design.

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Self-Study:

The self-study content will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study content.

Assignments:

The students will be given 8-10 projects/assignments/case study based on the above syllabus as mentioned below:

- i. Interpretation of datasheet for a given analog IC
- ii. Interpretation of datasheet for a given digital IC

- iii. Interpretation of datasheet for a given mixed-signal IC
- iv. Case study on effects of EMI/EMC on medical devices and instruments
- v. Case study on effects of EMI/EMC on defense equipment
- vi. Case study on effects of EMI/EMC on aviation engineering
- vii. Case study on effects of EMI/EMC on electronic appliances
- viii. Case study on effects of EMI/EMC on other engineering devices and equipment

Suggested Readings:

1. Kim R. Fowler, Electronic Instrument Design, Oxford University Press.
2. Henry W. Ott, Noise Reduction Techniques in Electronic Systems, Wiley Publications.
3. John F. Wakerly, Digital Design Principles and Practices, Prentice-Hall International.
4. Robert F. Coughlin, Operational Amplifiers and Linear Integrated Circuits, Prentice-Hall.
5. Walter C. Bosshart, Printed Circuit Boards-Design and Technology, TMH.

L = Lecture, T = Tutorial, P = Practical, C = Credit