NIRMA UNIVERSITY
SCHOOL OF TECHNOLOGY, INSTITUTE OF TECHNOLOGY
M. Tech. in Electronics & Communication Engineering (Embedded System)
M.Tech Semester - I

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Course Code	6EC205CC22
Course Title	Electronic System Design

Course Learning Outcomes (CLOs):

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

1. Analyze the design issues in analog, digital and mixed signal circuit design.
2. Utilize ADC-DAC for electronic systems.
3. Design op-amp based circuits and power supply used in electronic systems.
4. Interpret the concept of electromagnetic interference, electrostatic discharge and techniques to reduce them in electronic systems.

Syllabus: **Teaching Hours:45**

UNIT I: Practical Analog and Mixed Signal Circuits **02**

Design Issues and Techniques, Passive components, Understanding and interpreting data sheets and specifications of various passive and active components, non-ideal behaviour of passive components

UNIT II: Op amps **07**

DC performance of op amps: Bias, offset and drift, AC Performance of operational amplifiers: band width, 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 filers: design of low pass, high pass and band pass filters

UNIT III: ADCs and DACs **03**

Characteristics and performance parameters of ADC & DAC, interfacing to microcontrollers, selecting proper ADC and DAC

UNIT IV: Power supplies **05**

Characteristics, design of full wave bridge regulated power supply, Circuit layout and grounding in mixed signal system, Filtering in Electronic Systems: Power line filtering, power supply decoupling, decoupling filters, high frequency filtering and system bandwidth

UNIT V: Practical Logic Circuit Design Issues and Techniques **09**

Understanding and interpreting data sheets, specifications of various CMOS & BiCMOS family Logic devices, Electrical behaviour (steady state & dynamic) of CMOS & BiCMOS family logic devices, Benefits and issues on migration of 5-volt and 3.3 volt logic to lower voltage supplies. CMOS/TTL Interfacing Basic design considerations for live insertion. JTAG/IEEE 1149.1 design considerations, Design for testability, estimating digital system reliability, Digital circuit layout and grounding, PCB design guidelines for reduced EMI

UNIT VI: Electromagnetic Compatability **02**

Designing for EMC, EMC regulations, typical noise path, methods of noise coupling and methods of reducing interference in electronic systems

UNIT VII: Cabling of Electronic Systems **05**

Capacitive coupling, effect of shield on capacitive coupling, inductive coupling, effect of shield on inductive coupling, effect of shield on magnetic coupling, magnetic coupling between shield and inner conductor, shielding to prevent magnetic radiation, shielding a receptor against magnetic fields, coaxial cable versus shielded twisted pair, ribbon cables

UNIT VIII: Grounding of Electronic Systems **04**

Safety grounds, signal grounds, single-point ground systems, multi-point ground systems, hybrid grounds, functional ground layout, practical low frequency grounding, hardware grounds, grounding of cable shields ground loops, shield grounding at high frequencies

UNIT IX: Protection Against Electrostatic Discharges (ESD) **05**

Static generation, human body model, static discharge, ESD protection in equipment design, software and ESD protection, ESD versus EMC

UNIT X: Packaging & Enclosures of Electronic System **03**

Effect of environmental factors on electronic system, nature of environment and safety measure, Packaging's influence and its factors

Self Study:

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

Suggested Readings:

1. Fowler, K. R., Electronic Instrument Design, 1st edition, Oxford University Press.
2. Ott, H. W., Noise Reduction Techniques in Electronic Systems, 2nd edition, John Wiley & Sons.
3. Wakerly, J. F., Digital Design Principles& Practices, 3rd edition, Prentice Hall International, Inc.
4. Coughlin, R. F., Operational Amplifiers and linear integrated circuits, 3rd edition, Prentice Hall International, Inc.
5. Thompson, M. T., Intuitive Analog circuit design, Elsevier.