



POWER MANAGEMENT INTEGRATED CIRCUITS

PROF. QADEER AHMAD KHAN

Department of Electrical Engineering
IIT Madras

TYPE OF COURSE : Rerun | Elective | UG/PG

COURSE DURATION : 12 weeks (GI Jan' 22 - FÍ Apr' 22)

EXAM DATE : GI Apr 2022

INTENDED AUDIENCE : Final year undergraduate, graduate, PhD students in Electrical/Electronic Engineering. Faculty, Industry professionals working in the area of analog IC design, VLSI, power management ICs.

PREREQUISITES : Analog Circuits or equivalent or industry experience in analog circuit design

INDUSTRY SUPPORT : Qualcomm, Texas Instruments, Intel, Sankalp Semiconductor, NXP Semiconductors, ST Microelectronics, Samsung, Microchip, ON semiconductor, Infineon, Renesas, Analog Devices

COURSE OUTLINE :

This course is intended to develop understanding of why power management circuits are needed in a VLSI system and what are the different components of a power management system with focus on voltage regulators. By the end of this course, students should be able to understand the concept behind power management circuits and design a linear (LDO) and switching regulator (dc-dc converter) for given specifications using behavioral and circuit level simulators.

ABOUT INSTRUCTOR :

Dr. Qadeer Khan is an Assistant Professor in the Integrated Circuits and System group of the Department of Electrical Engineering, Indian Institute of Technology Madras. He received the Bachelor's degree in Electronics and Communication Engineering from Jamia Millia Islamia University, New Delhi, India, in 1999 and the Ph.D. degree in Electrical and Computer Engineering from Oregon State University, USA in 2012.

COURSE PLAN :

Week 1 : Introduction to Power Management Circuits; Overview of Power Management System

Week 2 : Linear Voltage Regulators; Design of Linear Voltage Regulator (LDO)

Week 3 : Switching Voltage Regulators; Design of Buck Converter

Week 4 : Design of Boost Converter; Design of Buck-Boost Converter

Week 5 : Design of Full-Bridge Inverter; Design of Class-D Amplifier

Week 6 : Compensating a Voltage-Mode-Controlled Buck Converter; Designing Type-I (Integral), Type-II (PI) and Type-III (PID) Compensators;

Week 7 : Designing Type-III Compensator using Gm-C Architecture and Design Example

Week 8 : Designing the Gate-Driver (Gate Buffer and Non-Overlap Clock Generator)

Week 9 : Non-Linear Control Techniques for DC-DC Converters; Hysteretic Control -

Week 10 : Selecting the Process Node for a PMLines, Board-Level Layout Guidelines, EMI Considerations

Week 12 : Introduction to Advanced Topics in Power Management (continued)