



POWER MANAGEMENT INTEGRATED CIRCUITS

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Department of Electrical Engineering
IIT Madras

TYPE OF COURSE : New | Elective | UG/PG

COURSE DURATION : 12 weeks (27 Jan' 20 - 17 Apr' 20)

EXAM DATE : 26 Apr 2020

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

Week 2 : Bandgap voltage reference, PTAT and CTAT voltage reference

Week 3 : Review of 2nd order system, relationship between damping factor and phase margin

Week 4 : Load regulation and output impedance of LDO

Week 5 : Basic concept of switching regulator, inductor ripple current, volt-second balance

Week 6 : Output voltage ripple in dc-dc converter, ripple voltage vs. duty cycle

Week 7 : Compensating a voltage mode buck converter, type-I(integral) compensation

Week 8 : Current mode control

Week 9 : Hysteretic control, stability issues with hysteretic control

Week 10 : Selecting buck topology, switching frequency and external components

Week 11 : Choosing type of regulator in multi-chip system, selecting process node for PMIC

Week 12 : Introduction to advanced topics in PMIC