MICROELECTRONICS: DEVICES TO CIRCUITS

PROF. SUDEB DASGUPTA
Department of Electronics & Communication Engineering
IIT Roorkee

TYPE OF COURSE: Rerun | Core_Elective | PG/UG

COURSE DURATION: 12 weeks (20 Jul'20 - 09 Oct'20)

EXAM DATE: 18 Oct 2020

INTENDED AUDIENCE: Students of Computer science & Electrical Engineering

PRE-REQUISITES: First course on linear circuit analysis, A basic course on Semiconductor Devices and Digital Electronics. A course on Computer Organization will be also helpful (though not strictly required).

INDUSTRIES APPLICABLE TO: Cadence; Synopsys; ST Microelectronics; NXP Semiconductors; Semiconductor Complex Limited; Design House in general

COURSE OUTLINE:
This course aligns with the core courses in Electronics Circuits taught to undergraduates in Electrical and Computer Engineering. The objective of this course is to develop the ability to analyse and design electronic circuits both analog and digital, discrete and integrated. The course starts with the basics of the device most seldom encountered in mixed designs and then go on to do circuit analysis in the later parts.

ABOUT INSTRUCTOR:
Prof. S. Dasgupta is presently working as an Associate Professor, in Microelectronics and VLSI Group of the Department of Electronics and Communication Engineering at Indian Institute of Technology, Roorkee. He received his PhD degree in Electronics Engineering from Institute of Technology-Banaras Hindu University (currently IIT-BHU), Varanasi in 2000.

COURSE PLAN:

Week 1: Bipolar Junction Transistor
Week 2: MOS Transistor Basics
Week 3: CMOS Inverter Basics
Week 4: Biasing of MOS Amplifier and its behavior
Week 5: Multistage and Differential Amplifier
Week 6: s-domain analysis, Transfer function, Poles and Zeros, High Frequency Response of CS Configuration, Differential Amplifier, Cascade Connection and its Operation
Week 7: General Feedback structure and properties of negative feedback, Basic Feedback and CE Amplifier, Frequency Response of CC and SF Configuration, Frequency Response of the Differential Amplifier, Cascade Connection and its Operation
Week 8: Operational Amplifier
Week 9: Butterworth and Chebyshev Filters, First and Second Order Filter Functions, Switched Capacitor based filters, Single-Amplifier Biquadratic Filters, Second Order LCR Resonator
Week 10: Combinational Logic Design-I, II, III & IV
Week 11: Sequential Logic Design
Week 12: Clock Strategies for Sequential Design