Graduate Diploma in Integrated Circuits (IC) and Systems Design (Offline/Online Optional)

Organized by:
Department of Electrical Engineering,
FAST NUCES ISLAMABAD
Duration : 2 Semesters (09 Month),
1st Sept 2020 – 30th June 2021

ICD
Integrated Circuit Design Lab

RFCS²
Radio Frequency Circuit Sensors & System Lab

WHY INTEGRATED CIRCUITS (ICs) DESIGN ?

- IC Design is pivotal in 21st century technology trends; e.g. 5G systems, Artificial Intelligence (AI), and smart systems, which are supposed to be leading towards 5th industrial revolution
- Resulting a high demand of IC design engineers globally
- Can be an excellent addition in resume for higher studies or job search abroad
- Lack of skilled IC designers in Pakistan is a major bottleneck in international investments in circuit design sector
- A pool of skilled IC designers can attract **international companies in Pakistan**

WHY FROM FAST NUCES ?

- A unique diploma program ***first time in Pakistan***.
- Unique place in Pakistan to have IC design experience on ***Licensed Cadence Tool Suite***
- Offers <u>hands-on</u> experience of IC design on ***TSMC officially provided 65nm, 130nm, and 150nm*** process development kits (PDKs)
- Each student will design and ***Fabrication the IC in TSMC 65nm CMOS node.***
- A platform to learn modern IC design technique from ***Academics and Industrial Experts***

ELIGIBILITY

- Bachelor of:
  - Electrical/Electronics Engineering
  - Telecommunication Engineering
- Pre-requisite:
  - Basic undergrad electronics courses
  - Excellent PA in Electronics Courses
  - Passion for the Electronics design.

WHO SHOULD ENROLL

- Electrical Engineers looking for:
  - IC design skills
  - PCB design skills
- Higher education aspirant from international universities
- Engineer aiming for stepping in semiconductor industry

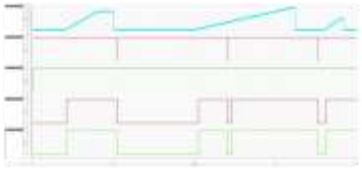
PROGRAM OUTCOME

- Will create a poll of skilled IC design engineers
- Pave the way for domestic IC design startups
- Help to eliminate the major issue of skilled technical workforce to attract international companies

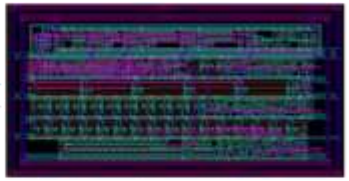
PROGRAM OBJECTIVES

- Introduction to CMOS integrated circuits basics and fabrication process
- Detailed illustration and hands on experience of complete integrated circuit system design

IC Schematic Design



Simulation and Analysis

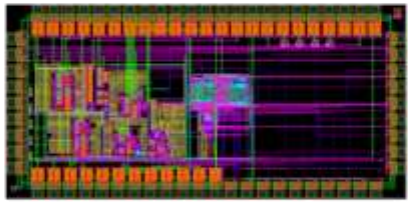


Custom Layout Design

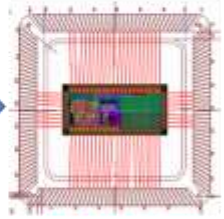
Design Rule Check

Layout vs Schematic check

Verilog Digital Design Synthesis



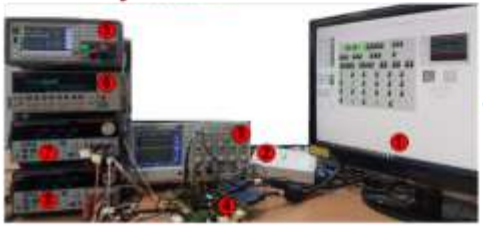
Top Level IC Compilation



IC Packaging

Printed Circuit Bard (PCB) Design

PCB Assembling



Fabricated IC Testing

TEACHING AND TECHNICAL STAFF

Prof. Dr. Rashad Ramzan

M.S. Royal Institute of Technology Stockholm, Sweden

Ph.D. Linkoping University, Sweden.

Professor Dept. of Electrical Engineering (EE), FAST, NUCES, ISB.

Dr. Hassan Saif

M.S. & Ph.D. Sungkyunkwan University, South Korea.

Asst. Prof., Dept. of EE FAST, NUCES, ISB.

Engr. Muhammad Omar

Sr. Design Engr. (High Frequency Sensors), Dept. of EE FAST, NUCES, ISB.

Engr. Abdul Jabbar

RF Design Engr. (RF Elect. & Frontend), Dept. of EE FAST, NUCES, ISB.

Engr. Abdul Wajid

Lab Engr. (IC Design), Dept. of EE FAST, NUCES, ISB.

Engr. Hamza Atiq

Lab Engr. (RF & IC Design), Dept. of EE FAST, NUCES, ISB.

COURSE OUTLINE

PRE-SEMESTER

2 Week Crash Course

Course Contents

CMOS device characteristics, Combinational logic design, Sequential logic design, Verilog digital logic Synthesis and CAD Tools

SEMESTER 1

Mixed Signal IC Design

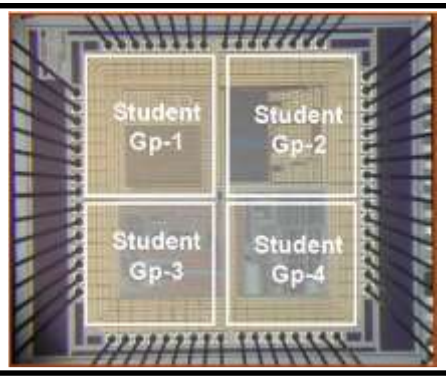
Non-linearity & Mismatch, IC fabrication process, Layout fundamentals, Sample and hold circuits, Performance metrics Digital to analog converters, Analog to Digital Converters, Z – Transform, Reference generators, Phase Lock Loop

Signal Integrity & SoC Design

Signal integrity principals, Chip interconnect, Transmission lines and power planes, Clock distribution network , Pad types, Pad driver circuits, High speed characteristic, IBIS modeling IC Packaging types

SEMESTER 2 (IC DESIGN PROJECT)

- IC design Group Project
- Schematic design to IC Tapeout for each student
- IC post-fabrication processing and packaging design
- IC testing tool & instruments training
- Fabricated IC testing and analysis
- Technical paper writing



REGISTRATION FEE AND DETAILS

- Total Seats = 16 (8 Fellows + 8 Self Sponsored); Fee= 100K Pak Rs.
- When filling the form you can apply for fellowship.
- Tution Fee = PKR 100,000/- (inclusive of IC fabrication & testing facilities)
- Registration: Send the email to hassan.saif@nu.edu.pk, and CC to abdul.wajjid@nu.edu.pk
- Send Self written ½ page Application (Why you want to apply?) , CV (include the GPA in Electronics Courses), Detail Marks Sheets
- Further Info: http://isb.nu.edu.pk/rfcs2/MS.htm

FELLOW SPONSORS

- Dr. Khurram Muhammad (2 fellows)
- Dr. Bilal Zafar (2 fellows)
- Dr. Azam Beg (2 fellows)
- Dr. Rana Azhar (1 fellow)
- Dr. Imtinan Elahi (1 fellow)